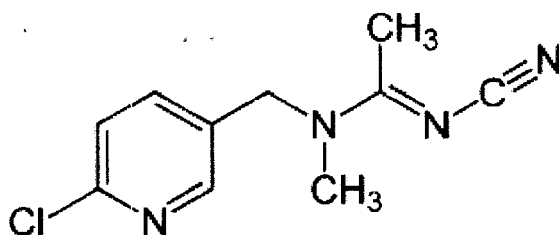


Problem Formulation for the Environmental Fate and Ecological Risk, Endangered Species, and Drinking Water Assessments in Support of the Registration Review of Acetamiprid



(E)-N¹-[(6-chloro-3-pyridyl)methyl]-N²-cyano-N¹-methylacetamidine
CAS No. 135410-20-7
PC Code: 099050

Prepared by:

Katrina White, Ph.D., Biologist
Scott Glaberman, Ph.D., Biologist
Environmental Risk Branch IV

U. S. Environmental Protection Agency
Office of Pesticide Programs
Environmental Fate and Effects Division
Environmental Risk Branch IV
1200 Pennsylvania Ave., NW
Mail Code 7507P
Washington, DC 20460

Reviewed by:

Jim Carleton, Ph.D., Senior Scientist
Thomas Steeger, Ph.D., Senior Science Advisor
Marietta Echeverria, Branch Chief
Environmental Risk Branch IV

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1. Purpose

The purpose of this problem formulation is to provide an understanding of the environmental fate and ecological effects of the registered uses of acetamiprid ((E)-N1-[(6-chloro-3-pyridyl)methyl]-N2-cyano-N1-methylacetamidine). Acetamiprid is a neonicotinoid insecticide registered for the following agricultural crops: alfalfa, apple, beans, blueberry, bushberry, caneberry, bulb vegetables, cole crops, cucurbit vegetables, fruiting vegetables, leafy vegetables, citrus, clover, cotton (unspecified), crabapple, cranberry, deciduous fruit trees (unspecified), grapes, leafy vegetables, legume vegetables, onion, ornamental herbaceous plants, ornamental nonflowering plants, ornamental wood shrubs and vines, pear, pine seedlings, pome fruits, Irish white potato, root and tuber vegetables, small fruits, soybeans, strawberry, tobacco, tomato, and tree nuts. Acetamiprid is registered for the following residential/commercial use areas/sites: ornamental and flowering plants, ornamental shrubs, ornamental trees, houseplants, gardens, poplar trees, preconstruction sites, households, outdoor building perimeters, residential areas, greenhouses, shadehouses, and lathouses. It is also registered to control ants, cockroaches, termites, and various other insects indoors and outdoors. This document will provide a plan for analyzing data relevant to acetamiprid and for conducting environmental fate and ecological risk, endangered species, and drinking water assessments for its registered uses. Additionally, this problem formulation is intended to identify data gaps, uncertainties, and potential assumptions used to address those uncertainties relative to characterizing the ecological risk associated with the registered uses of acetamiprid.

2. Description of Regulatory Action

The Food Quality Protection Act (FQPA) of 1996 mandated the Environmental Protection Agency (EPA) implement a new program for assessing the risks of pesticides, *i.e.*, Registration Review¹. All pesticides distributed or sold in the United States (U.S.) generally must be registered by EPA. The decision to register a pesticide is based on the consideration of scientific data and other factors showing that it will not cause unreasonable risks to human health, workers, or the environment when used as directed on product labeling. The Registration Review program is intended to ensure that, as the ability to assess risk evolves and as policies and practices change, all registered pesticides continue to meet the statutory standard of no unreasonable adverse effects to human health and the environment. Changes in science, public policy, and pesticide use practices will occur over time; through the new Registration Review program, the Agency periodically reevaluates pesticides to ensure that as change occurs, products in the marketplace can be used safely.

As part of the implementation of the Registration Review program pursuant to Section 3(g) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Agency is beginning its evaluation to determine whether acetamiprid continues to meet the FIFRA standard for registration. This problem formulation for the environmental fate and ecological risk assessment chapter in support of the Registration Review is intended for the initial docket opening the public phase of the review process.

¹ http://www.epa.gov/oppsrrd1/registration_review

3. Conclusions from Previous Risk Assessments

3.1. Ecological Risk Assessments

Acetamiprid is used in outdoor sites and thus has the potential to result in exposures to wildlife. The Agency conducted a new chemical ecological risk assessment and drinking water assessment on acetamiprid in 2002. New use requests prompted five additional assessments completed in 2004, 2005, 2007, 2009, and 2011. These assessments serve as a basis for this problem formulation. The assessments are briefly discussed below.

A Section 3 new chemical ecological risk assessment was conducted for acetamiprid use on flowers and ornamentals, leafy vegetables, cole crops, cotton, fruiting vegetables, citrus, pome fruits, grapes and seeds (USEPA, 2002, D270368). The highest proposed maximum seasonal application rate for any crop was 0.6 pounds active ingredient per acre (lbs ai/A) for pome fruits. Acetamiprid was characterized as posing low risk to the environment relative to most other insecticides based on its selective toxicity, low use rates, and relatively rapid rate of degradation. Direct acute risk to aquatic invertebrates with direct application into shallow water bodies was predicted, and chronic risks to some species of aquatic invertebrates (due to the selectivity of acetamiprid) were predicted for other uses. Direct risk to Federally-listed threatened or endangered species (hereafter referred to as “listed species”) of terrestrial wildlife, terrestrial plants, and saltwater invertebrates were also predicted. Direct effects on terrestrial invertebrates were presumed based on acetamiprid being an insecticide; however, actual risk to terrestrial invertebrates was not quantified. The only residue of concern evaluated was the parent acetamiprid.

Subsequent new use assessments were conducted for tobacco, potatoes, and residential uses in 2004 (USEPA, 2004, D304025) and for cucurbits, stone fruits, and tree nuts in 2005 (USEPA, 2005, D319610). The 2004 assessment indicated that acetamiprid may pose direct acute risks to non-listed and listed freshwater invertebrates, listed mammals, and listed terrestrial plants while the 2005 assessment indicated additional chronic risks to non-listed and listed aquatic invertebrates and non-listed and listed mammals and both acute and chronic risks to non-listed and listed birds. Additionally, direct risk to listed terrestrial plants was indicated. The maximum seasonal application rate for tree nuts (0.72 lbs ai/A) assessed in 2005 was higher than the highest rate previously evaluated. The risk assessments also noted that acetamiprid was moderately toxic to bees and belonged to a class of chemicals that has been associated with causing behavioral effects in bees. Potential for indirect effects to fish was also identified. The only residue of concern evaluated in the risk assessment was parent acetamiprid.

A 2007 assessment (USEPA, 2002, D270368) for new uses on berries, bulb vegetables, succulent legumes, and strawberries concluded that the proposed application rates were lower than those previously assessed, resulting in lower risk quotients (RQs); however, RQ values still exceeded the Agency’s levels of concern (LOCs) for the same previously identified taxa. The only residue of concern evaluated in the risk assessment was the parent acetamiprid.

A 2009 new use assessment (Morrica *et al.*, 2005) for new uses on red clover and the climbing

vine small fruit subgroup (crop subgroup 13-07F, except fuzzy kiwifruit) indicated that the proposed uses could result in direct effects to birds (and to reptiles and terrestrial-phase amphibians for which birds serve as surrogates) on both an acute and chronic exposure basis (USEPA, 2009, D364328). Listed freshwater and estuarine/marine aquatic invertebrates and mammals may be affected by acute exposures to acetamiprid, and freshwater and estuarine/marine aquatic invertebrates may be directly affected by chronic exposures. Finally, the assessment also indicated that listed dicotyledonous plants could be adversely affected by spray drift from aerial applications to grapes and climbing vine small fruits. Indirect effects were predicted for aquatic plants, fish (and aquatic-phase amphibians for which fish serve as surrogates), estuarine/marine fish and aquatic invertebrates. The assessment considered the parent and the degradate, IM 1-4, as residues of concern and risk was evaluated using a total toxic residue approach.² Overall, the inclusion of IM-1-4 did not affect the risk conclusions.

In 2011, an assessment was completed for both existing and newly proposed agricultural uses of acetamiprid (described in **Table 3-1**); the uses that have been approved are included in this document, while uses that are still pending are not discussed. The existing uses were re-evaluated for aquatic organisms because the degradate IM 1-4 and unextracted residues were assumed to also be residues of concern; therefore, a total toxic residues approach was used to assess risk of both existing and proposed uses. IM-1-4 was considered as a residue of concern in this assessment because it has a considerably longer half-life than the parent compound and available data suggest it is as toxic as the parent compound to aquatic animal species. The screening-level risk assessment concluded that all proposed uses of acetamiprid have the potential for direct acute effects to listed aquatic invertebrates. There was also the potential for direct acute effects to non-listed aquatic invertebrates for five of the seven crop uses (including fruiting vegetables, citrus, and pome fruit). The Agency's chronic LOC for aquatic invertebrates was also exceeded for all proposed crop uses of acetamiprid.

The assessment in 2011 also indicated that for terrestrial organisms, there was a potential for direct acute effects to both listed and non-listed birds (reptiles and terrestrial-phase amphibians) for all of the proposed crop uses of acetamiprid. The higher risk estimates for birds compared to previous assessments were based on a recently study in zebra finches (*Taeniopygia guttata*) where acetamiprid was shown to be very highly toxic to passerine birds on an acute exposure basis. The assessment also indicated that acetamiprid had the potential to cause direct acute effects to listed mammals and terrestrial plants for all uses evaluated except for soybeans. In addition, there was also potential for direct effects to non-listed terrestrial plants for assessed uses on citrus and pome fruit.

Although the 2011 assessment did not predict direct risk to fish and aquatic plants for any assessed uses, the assessment noted that indirect effects to all taxa except aquatic non-vascular plants could occur due to effects on prey or habitat.³

² The residues of concern for ecological risk assessment are defined by the Environmental Fate and Effects Division. The residues of concern for human health drinking water are the parent only and these are determined by the Health Effects Division.

³ Indirect effects to terrestrial and aquatic vascular plants may occur due to effects on birds and mammals that are

Table 3-1. Existing Uses Assessed in the Completed Ecological Risk Assessments

| Use Site/ Source | Year Assessed | Single App. Rate (lbs. ai/A) | Number of Apps. | Seasonal App. Rate (lbs. ai/A) | Interval Between Apps. (days) | Comments |
|---|------------------|---|---------------------------|--------------------------------|-------------------------------|---------------------------|
| Ready to Use Hand spray on Ornamentals, Citrus, Vegetables, and Fruits | 2002 | NS | NS | NS | 7 | -- |
| Residential Uses | 2004 | 2.2 | NS | NS | NS | -- |
| Ornamental and Flowering Plants | 2002 | 0.15 lbs ai | NS | 0.55 lbs ai | 7 | -- |
| Cotton | 2002, 2011 | 0.1 | 4 | 0.4 | 7 | -- |
| Leafy Vegetables within Crop Group 4 | 2002, 2011 | 0.075 | 5 | 0.375 | 7 | -- |
| Head and Stem Cole Crops | 2002, 2011 | 0.075 | 5 | 0.375 | 7 | -- |
| Fruiting Vegetables (within Crop Group 8-10) | 2002, 2011 | 0.075 | 4 | 0.3 | 7 | -- |
| Canola | 2002 | 0.03 (5.0 g ai/kg seed; 6 lbs treated seed/A) | 1 | NA | NA | -- |
| Citrus (within Crop Group 10-10) | 2002, 2011 | 0.25 | 5 | 0.55 | 7 | -- |
| | | 0.25 (assumed ²) | 2 (assumed ²) | | 7 | -- |
| | | 0.11 (assumed ²) | 5 | 0.55 | 7 | -- |
| Pome Fruit (within Crop Group 11-10) | 2002, 2011 | 0.15 | 4 | 0.60 | 12 | -- |
| Tuberous and Corm Vegetables (within Crop Sub-group 1C) | 2004, 2011 | 0.075 | 4 | 0.3 | 7 | -- |
| Tobacco ² | 2004, 2011 | 0.075 | 4 | 0.3 | 7 | None |
| Grapes and Other Climbing Small Fruits (except Fuzzy Kiwifruit, within Crop Sub-group 13-07F) | 2002, 2009, 2011 | 0.1 | 2 | 0.2 | 14 | None |
| Stone Fruit (within crop Group 12) | 2005, 2011 | 0.15 | 4 | 0.6 | 10 | None |
| Cucurbits (within Crop Group 9) | 2005, 2011 | 0.10 | 5 | 0.5 | 5 | Multiple seasons per year |
| Tree Nuts (within Crop Group 14, including Pistachio) | 2005, 2011 | 0.18 | 4 | 0.72 | 7 in 2005 14 in 2011 | -- |
| Edible Podded Legume (within Crop Subgroup-6A) | 2007, 2011 | 0.1 | 3 | 0.3 | 7 | -- |

pollinators or important in seed dispersal of the species.

| Use Site/ Source | Year Assessed | Single App. Rate (lbs. ai/A) | Number of Apps. | Seasonal App. Rate (lbs. ai/A) | Interval Between Apps. (days) | Comments |
|---|---------------|--|-----------------|---------------------------------------|-------------------------------|-----------------------------------|
| and Succulent Shelled Peas and Beans (within Crop Sub-group 6B) | | | | | | |
| Strawberries and Other Low Growing Berries (within Crop Sub-group 13-07G) | 2007, 2011 | 0.13 | 2 | 0.26 | 7 | -- |
| Blueberries and Other Bush Berries (within Crop Sub-group 13-07B) and Cane Berries (within Crop Sub-group 13-07A) | 2007, 2011 | 0.085 | 5 | 0.5 | 7 | -- |
| Onions and Other Bulb Vegetables (within Crop Group 3-07) | 2007, 2011 | 0.15 | 4 | 0.6 | 7 | -- |
| Clover (for use in OD, OR, and WA only) | 2009, 2011 | 0.075 | 1 | 0.075 | NA | -- |
| Mustard | 2002 | 0.03 (5.0 g ai/kg seed; 6 lbs treated seed/A) | 1 | NA | NA | -- |
| Soybean | 2011 | 0.04 | 2 | 0.078 (0.08 assumed ¹) | 7 | 150 foot buffer 25 foot buffer |

Abbreviations: App=Application

¹ Assumed for Tier I aquatic exposure modeling and terrestrial exposure modeling because it is not possible to model multiple applications at different rates.

² Scenarios were assumed for modeling purposes because the five applications of the single maximum application rate cannot be made according to the maximum seasonal application rate.

3.2. Drinking Water Assessments

The outdoor uses of acetamiprid potentially contribute residues to drinking water. The most recent Tier I drinking water assessment to support a human health risk assessment was completed in 2011 (USEPA, 2011, D394234, D394479). The assessment analyzed the drinking water concentrations for a number of proposed and existing agricultural uses assessed in the 2011 Ecological Risk Assessment (see **Table 3-1**). The Metabolism Assessment Review Committee (MARC) reported that the residue of concern for acetamiprid is the parent only (USEPA, 2001). Unextracted residues were observed in aerobic soil and aerobic aquatic metabolism studies and in some studies it was uncertain whether some of the unextracted residues contained parent compound (MRIDs 46255603, 44651881, 44699101, 44651879, 44988513, and 44988512).⁴ Additionally, the extraction techniques were not exhaustive and it is

⁴ If unextracted residues formed along with loss of the parent compound it is possible that some of the unextracted residues are the parent compound; however, if the parent degraded significantly in the beginning of the study and

likely that if different extraction techniques were used, a higher percentage would be extracted. Therefore, when it was uncertain, half-lives used in surface water and ground water modeling were estimated assuming that the unextracted residues were the parent compound. Then these new half-life values based on residues of parent and unextracted residues were used in modeling to estimate drinking water concentrations.⁵ When the parent was shown to degrade at the beginning of the study and unextracted residues did not appear until the end of the study, it was assumed that the unextracted residues were not the parent compound.⁶ Estimated drinking water concentrations (EDWCs) in surface water were derived using FQPA Index Reservoir Screening Tool (FIRST version 1.1.1, March 25, 2008) and ground water concentrations were estimated using the Screening Concentration in Ground Water (SCI-GROW version 2.3, July 29, 2003). For existing uses, the highest acute EDWC (estimated for acetamiprid use on tree nuts) was 42.8 µg acetamiprid+unextracted residues/L water and the annual average concentration was 12.2 µg acetamiprid+unextracted residues/L water. The highest estimated ground water concentration for existing uses was 0.013 µg/L. Whether EDWC will result in a human health risk concern is determined by considering EDWC as a part of aggregate dietary exposure (food and water) and comparing dietary exposure estimates to mammalian toxicity endpoints (modified by the necessary uncertainty and/or safety factors) to determine whether the LOC is exceeded for the dietary exposure pathway. Because of the absence of data on acetamiprid, the potential effects of drinking water treatment (*e.g.*, chlorination, ozonation) were not considered in the assessment.

4. Mechanism of Action

Acetamiprid is a chloronicotinyl insecticide belonging to the cyano-substituted sub-class of the neonicotinoid pesticides, which also includes thiacloprid (CAS No. 111988-49-9). Similar to other neonicotinoids including nitroguanidine-substituted compounds such as imidacloprid, clothianidin, dinotefuran and thiamethoxam, acetamiprid is a systemic, broad-spectrum insecticide that acts as a stomach poison against sucking and some biting insects (Sur and Stork, 2003). The compound acts as an agonist of the nicotinic acetylcholine receptor (nAChR) at the postsynaptic membrane of nerve cells. The active ingredient interrupts the function of the insect nervous system. As reported in the original Section 3 risk assessment, biochemical radio-ligand binding studies show that acetamiprid interacts with high affinity at the nAChR binding site in insects, and with low affinity at the nAChR in vertebrates (USEPA, 2002, D270368). The cyano-substituted neonicotinoids exhibit a lower toxicity to honeybees (LD₅₀ values of <12.5 to 14.6 µg/bee) than the nitro-substituted neonicotinoids (18 to 138 ng/bee) (Iwasa *et al.*, 2004). Inhibition of cytochrome P450 activity in honeybees (*Apis mellifera*) resulted in increased toxicity of acetamiprid, indicating that P450 metabolism is an important detoxifying pathway for insects (Iwasa *et al.*, 2004).

unextracted residues did not form until the end of the study, the unextracted residues are unlikely to be the parent compound.

⁵ Half-lives including unextracted residues were calculated and used in modeling for the aerobic soil metabolism studies (MRID 46255603, 44651881 for clay loam soil, MRID 44651879) and aerobic aquatic metabolism studies (MRID 44988513), and anaerobic aquatic metabolism studies (MRID 44988512).

⁶ This occurred in two soils (sandy loam and silty clay loam) in an aerobic soil metabolism study (MRID 44651881).

5. Overview of Pesticide Usage

5.1. Summary of Products and Overview of Usage

Acetamiprid was first registered in 2002 (USEPA, 2012). It is an insecticide used to control a variety of insects including aphids, beetles, caterpillars, leafhoppers, stinkbugs, thrips, whiteflies, boll worms, fleahoppers, earwigs, silverfish, termites, ants, cockroaches, weevils, Colorado potato beetles, potato psyllids, wireworms, household pests, bedbugs, Lygus bug, carpenterworm, apple maggots, borers (excluding the Emerald ash borer) and scale insects. There are currently 37 Section 3 registrations containing acetamiprid and 14 Section 24C (Special Local Needs) registrations (**Table 5-1**). Some formulated end products of acetamiprid contain other active ingredients in addition to acetamiprid; a flowable concentrate (Reg. No. 8033-116) and two termiticides (Reg. No. 8033-96 and 8033-109⁷) also contains the synthetic pyrethroid insecticide bifenthrin (CAS No. 82657-04-3) and one homeowner product (Reg. No. 8033-108) contains the conazole fungicide triticonazole (CAS No. 131983-72-7). Use sites include agriculture, residential, commercial, industrial, and nursery use sites. All use sites are described in more detail in the following sections.

Formulations include water dispersible granules (WDG), emulsifiable concentrates (EC), soluble concentrates (SC), liquids, water soluble packets (WSP), impregnated stickers, impregnated bait stations, gels, and an attract-and-kill device. Water dispersible granules, EC, SC, and WSP are applied as ground or aerial sprays and may result in spray drift. Gels are used as spot treatments, beads, and thin films to control ants and cockroaches. Water dispersible granules are all applied as a liquid. There are also seed treatment uses on potatoes, canola, and mustard. Some liquid formulations are injected into trees. Termiticides may be applied as a liquid or foam. They may be applied on soil surfaces as a perimeter treatment, crack and crevice treatment, or brush and spray. They may also be applied into soil using trenching, rodding, sub slab injection, and soil excavation techniques. Some termiticide products are applied to subsurfaces into piping, injections, and reticulation delivery systems. The impregnated materials are generally stickers used to control flies. The attract-and-kill device is a pheromone mixed with acetamiprid that is hung in trees.

Table 5-1. Summary of Section 3 and Section 24C (Special Local Need) Registrations for Acetamiprid (completed 04/12/2012)

| Reg. Number | Registration Name | Percent Acet. | Form. | General Summary of Use Sites | Target pests |
|---|---------------------------|---------------|-------|--|---|
| Agricultural Use Patterns That Are not Seed Treatments | | | | | |
| 8033-20 | Acetamiprid Technical | 99.5 | | | |
| 8033-22 | Tristar 70WSP Insecticide | 70 | WSP | Ornamentals ^j | Many: aphids, beetles, caterpillars, thrips, etc. |
| 8033-23 | Assail 70WP Insecticide | 70 | WP | Many: cotton, fruits, vegetables, tobacco, tree nuts, clover, etc. | Many: aphids, whitefly, weevils, thrips, etc. |

⁷ These are the parent labels for SLN registration numbers OK110002 and OK100003.

| Reg. Number | Registration Name | Percent Acet. | Form. | General Summary of Use Sites | Target pests |
|------------------------|--------------------------------|-----------------------|-------|--|--|
| 8033-24 | Intruder Brand Insecticide | 70 | WP | Cotton | Aphids, whitefly, plant bugs, fleahopper, boll worm |
| 8033-36 ^c | Assail 30 SG Insecticide | 30 | WDG | Many: cotton, fruits, vegetables, tobacco, tree nuts, clover, <i>etc.</i> | Many: aphids, whitefly, weevils, thrips, <i>etc.</i> |
| 8033-26 ^a | Acetamiprid 70 WSP Insecticide | 70 | WSP | Outdoor use only | Ants, termites |
| 8033-94 | Tristar 30 SG Insecticide | 30 | SC | Ornamentals and vegetables | Many: aphids, whitefly, thrips, <i>etc.</i> |
| 8033-101 ^f | Acetamiprid SL Insecticide | 8.5 | SC | Cotton | Aphids, whiteflies |
| 8033-106 | TRISTAR 8.5 SL INSECTICIDE | 8.5 | SC | Ornamentals, transplants of leafy & fruiting vegetables, greenhouse tomatoes | Broad range, including aphids, whiteflies, scales, caterpillars, weevils, leafminers |
| 8033-116 ^h | Justice OF Insecticide | 13 10 ^e | FC | Soybean | Many, including aphids, beetles, earworm, rootworm, grasshoppers |
| ID070011 | Assail 70 WP Insecticide | 70 | WP | Alfalfa | Lygus bug |
| ID090014 | Assail 30 SG Insecticide | 30 | WDG | Alfalfa seed crop | Lygus bug |
| NV070004 | Assail 70 WP Insecticide | 70 | WP | Alfalfa seed crop | Lygus bug |
| OR070017 | Assail 70 WP Insecticide | 70 | A&K | Alfalfa seed crop | Lygus bug |
| OR090005 | Assail 70 WP Insecticide | 70 | WP | Poplar (hybrid) | Carpenterworm |
| UT090001 | Assail 70 WP Insecticide | 70 | WP | Alfalfa seed crop | Lygus bug |
| WA060009 | Tristar 30 SG insecticide | 30 | SC | Fruit and nut trees (non-bearing), apples, crabapples, pears, ornamental plants and trees | Apple maggot |
| WA060011 | Tristar 70 WSP Insecticide | 70 | WSP | Crabapples, pears, fruit trees, crops, ornamental plants, ornamental trees, residential areas, nonag areas (public health) (outdoor) | Apple maggot |
| WA070006 | Assail 70 WP Insecticide | 70 | WP | Alfalfa seed crop | Lygus bug |
| WA110010 | Tristar 8.5 SL Insecticide | 8.5 | SC | Apples, crabapples, pears, ornamental plants and trees, non-bearing fruit and nut trees in non-agricultural quarantine and pest-free areas (including residential areas) | Apple maggot |
| WY080010 | Assail 70 WP Insecticide | 70 | WP | Alfalfa seed crop | Lygus bug |
| Seed Treatments | | | | | |

| Reg. Number | Registration Name | Percent Acet. | Form. | General Summary of Use Sites | Target pests |
|--|--|---------------------------|------------------------------------|---|--|
| 8033-95 ^d | Acetamiprid 50 FS Insecticide Seed Treatment | 40 | RTU liquid | Canola and mustard seed, potato seed piece | Aphids, Colorado potato beetle, flea beetle, leaf hopper, potato psyllid, wireworm |
| Ready To Use Products/Homeowner Use That are not Ant Baits or Impregnated Materials | | | | | |
| 8033-21 | Acetamiprid RTU Insecticide | .006 | RTU spray | Ornamentals, vegetables, citrus, pome fruits | Many: aphids, beetles, caterpillars, leafhoppers, stinkbugs, etc. |
| 8033-25 | Acetamiprid 70 WSP Insecticide For Homeowner Use | 70 | WSP | Outdoor building perimeters | Ants, earwigs, silverfish, termites etc. |
| 8033-107 ^e | Acetamiprid Concentrate Insecticide | 0.5 | | Ornamentals, vegetables, fruits, houseplants | Many: aphids, whitefly, thrips, etc. |
| 8033-108 | Acetamiprid + Triconazole Concentrate | 0.26 0.78 ⁱ | | Ornamentals, roses, flowers, trees, shrubs, houseplants | Many: aphids, whitefly, thrips, etc. |
| 8033-107 ^e | Acetamiprid Concentrate Insecticide | 0.5 | | Ornamentals, vegetables, fruits, houseplants | Many: aphids, whitefly, thrips, etc. |
| Ant and Cockroach Baits and Gels | | | | | |
| 8033-28 | Acetamiprid (F5025) 0.15% Sweet Bait Gel-Ants OTC | 0.15 | Gel | Indoor/outdoor | Sweet and grease eating ants |
| 8033-29 ^b | Acetamiprid (F5025) 0.15% Sweet Bait Gel Ants PMP | 0.15 | Gel | Indoor/outdoor | Ants |
| 8033-30 | Acetamiprid (F5025) 0.15% Sweet Bait Gel Cockroach OTC | 0.15 | Gel | Indoor/outdoor | Cockroaches |
| 8033-31 | Acetamiprid (F5025) 0.15% Sweet Bait Gel Cockroaches | 0.15 | Gel | Indoor/outdoor | Cockroaches |
| 8033-32 | Acetamiprid (F5025) Bait Station Cockroaches-OTC | 0.35 | IM-BS in child-resistant container | Indoor/outdoor | Cockroaches |
| 8033-33 | Acetamiprid (F5025) Bait Station Cockroaches-PMP | 0.35 | | Indoor/outdoor | Cockroaches |
| 8033-34 | Acetamiprid (F5025) 0.35% | 0.35 | Gel | Indoor/outdoor | Cockroaches |

| Reg. Number | Registration Name | Percent Acet. | Form. | General Summary of Use Sites | Target pests |
|---------------------|--|-----------------------------|--------|---|--|
| | Protein Bait Gel Cockroach OTC | | | | |
| 8033-35 | Acetamiprid (F5025) 0.35% Protein Bait Gel PMP Cockroaches PMP | 0.35 | Gel | Indoor/outdoor | Cockroaches |
| 8033-90 | Acetamiprid (F5025) 0.35% Cockroach Bait Gel-OTC | 0.35 | Gel | Indoor/outdoor | Cockroaches |
| 8033-91 | Acetamiprid (F5025) 0.35% Cockroach Bait Gel-PM | 0.35 | Gel | Indoor/outdoor | Cockroaches |
| 8033-92 | Acetamiprid (F5025) 0.35% Cockroach Bait Station OTC | 0.35 | IM- BS | Indoor/outdoor | Cockroaches |
| 8033-93 | Acetamiprid (F5025) 0.35% Cockroach Bait Station PMP | 0.35 | IM- BS | Indoor/outdoor | Cockroaches |
| 8033-97 | Acetamiprid (F5025) 0.075% Sweet Bait Gel - Ants OTC | 0.075 | Gel | Indoor/outdoor | Ants |
| 8033-98 | Acetamiprid (F5025) 0.075% Sweet Bait Gel- Ants-PMP | 0.075 | Gel | Indoor/outdoor | Ants |
| 8033-99 | Acetamiprid (F5025) 0.075% Gel Bait Station Ants - OTC | 0.075 | IM- BS | Indoor/outdoor | Ants |
| 8033-100 | Acetamiprid (F5025) 0.075% Gel Bait Station Ants - PMP | 0.075 | IM- BS | Indoor/outdoor | Ants |
| 8033-105 | Acetamiprid 0.075% Protein Ant Bait Station OTC | 0.075 | IM- BS | Indoor/outdoor | Ants |
| Termiticides | | | | | |
| 8033-96 | F4688 50 WSP Insecticide Termiticide | 22.73 27.27 ^e | WSP | Indoor/outdoor, food/feed handling establishments; mattresses | Termites, household pests (ants, bees, wasps, biting flies, centipedes, chiggers, cockroaches, crickets, earwigs, fleas, ticks, flies, mosquitoes, spiders, |

| Reg. Number | Registration Name | Percent Acet. | Form. | General Summary of Use Sites | Target pests |
|------------------------------|---------------------------------------|-----------------------------|------------|--|--|
| | | | | | scorpions, silverfish, sowbugs, stink bugs, <i>etc.</i>), bedbugs |
| 8033-109 | F5688 11% ME Insecticide Termiticide | 5 6 ^e | EC | Indoor/outdoor, food/feed handling establishments | Termites, household pests (ants, bees, wasps, biting flies, centipedes, chiggers, cockroaches, crickets, earwigs, fleas, ticks, flies, mosquitoes, spiders, scorpions, silverfish, sowbugs, stink bugs, <i>etc.</i>), bedbugs |
| OK100001 | F4688 50 WSP Insecticide Termiticide | 22.73 27.27 ^c | WSP | Outdoors | Termites |
| OK110002 | F5688 11% ME Insecticide Termiticide | 5 6 ^e | EC | New or post-construction sub-concrete slab treatments through piping or similar delivery systems | Termites |
| OK100003 | Transport Termiticide Insecticide | 22.73 27.27 ^c | WSP | Outdoors | Termites |
| Impregnated Materials | | | | | |
| 8033-114 | F7180-8 Fly Sticker Insecticide - PMP | 4.4 | IM-sticker | Indoor/outdoor | House flies, little house flies, blow flies, bottle flies, flesh flies, phorid flies, fungus gnats, and vinegar (fruit) flies. |
| 8033-115 | F7180-8 Fly Sticker Insecticide OTC | 4.4 | IM-sticker | Indoor/outdoor | |

WP=wettable powder; SC=soluble concentrate; WSP=water soluble packet; RTU-ready to use; EC=emulsifiable concentrate; WDG=water dispersible granules; IM=impregnated material; FC=flowable concentrate; BS=bait station; Acet.=acetamiprid; reg=registration; OTC=over the counter; PMP=pest management professionals; A&K=attract-and-kill device

^a Only for Sale to, and for Use and Storage by Pest Management Professionals

^b Inject into cracks & crevices w/syringe or bait injector

^c Geographical restrictions for certain use sites; chemigation permitted for cranberries & potatoes only

^d Must not subsequently apply to potato plants grown from treated seed pieces; for canola & mustard, use only in commercial seed treatment facilities; all treated seed must be dyed; do not treat seed for fall planting

^e Percent bifenthrin

^f Chemigation prohibited

^g For residential use sites only; not for commercial production

^h Buffer is required with use

ⁱ Percent triticonazole

^j Not for woodlands or forest management, not for homeowner use

5.2. Agricultural Uses and Residential Uses on Plants

BEAD prepares a Label Use Information System (LUIS) Report summarizing all registered uses of a product. The EFED Table 1 report was used as the source to summarize all relevant uses of acetamiprid. The report was completed on April 16, 2012. **Table 5-2** summarizes all agricultural uses with maximum single application rates provided in lbs ai/A. These uses include aerial or ground broadcast applications of liquids to alfalfa, apple, beans, blueberry, bushberry, caneberry, bulb vegetables, cole crops, cucurbit vegetables, fruiting vegetables, leafy vegetables, citrus, clover, cotton (unspecified), crabapple, cranberry, deciduous fruit trees (unspecified), grapes, leafy vegetables, legume vegetables, onion, ornamental herbaceous plants, ornamental nonflowering plants, ornamental wood shrubs and vines, pear, pine seedlings, pome fruits, Irish white potato, root and tuber vegetables, small fruits, soybeans, strawberry, tobacco, tomato, and tree nuts. Seed treatments are also allowed on potatoes, canola/rape, and mustard. The maximum number of applications per year was not specified on the labels.

Table 5-2. Summary of Use Patterns of Acetamiprid with Well Defined Use Rates for Agricultural Crops

| Use Site | Application Method, Timing | Form | Max Single App. Rate (lbs ai/A) | Max # Apps / CC | Max App Rate/CC (lbs ai/A) | Max App Rate/Year (lbs ai/A) | Minimum Treatment Interval (days) |
|---|----------------------------------|---------|---------------------------------|-----------------|----------------------------|------------------------------|-----------------------------------|
| ALFALFA ¹ | Broadcast, Foliar | WP | 0.0744 | NS | NS | NS | NS |
| ALFALFA ² | Broadcast, Foliar | WP | 0.074-0.075 | 3, 44 | 0.225-.2975 | NS | 7, 14 |
| APPLE | Broadcast, Foliar | SC | 0.15 | NS | NS | NS | 12 |
| BEANS | Broadcast, Foliar | WDG | 0.0994-0.1006 | 3 | 0.3-0.3019 | NS | 7 |
| BLUEBERRY | Broadcast, Foliar | L-RTU | 0.0005 | 5 | NS | NS | 7 |
| BLUEBERRY, BUSHBERRY, CANEBERRY | Broadcast, Foliar | WDG, WP | 0.0994-0.1006 | NS, 5 | 0.4988-0.5006 | NS | 7 |
| BULB VEGETABLES | Broadcast, Foliar | WP | 0.1488-0.15 | 4 | 0.5994-0.6 | NS | 7 |
| BULB VEGETABLES, COLE CROPS, CUCURBIT VEGETABLES, FRUITING VEGETABLES, LEAFY VEGETABLES | Broadcast, Pretransplant, Foliar | L | 0.1529 | NS | 0.1529 | NS | NS |
| CANOLA\RAPE | Seed Treatment | L-RTU | 0.5039 lbs ai/lbs seed | NS | NS | NS | NS |

| Use Site | Application Method, Timing | Form | Max Single App. Rate (lbs ai/A) | Max # Apps / CC | Max App Rate/CC (lbs ai/A) | Max App Rate/Year (lbs ai/A) | Minimum Treatment Interval (days) |
|--|-----------------------------------|-------------|---------------------------------|-----------------|----------------------------|------------------------------|-----------------------------------|
| CITRUS | Broadcast, Foliar, Petal Fall | WDG, WP | 0.2494 | NS | 0.5494 | NS | 7 |
| CLOVER | Broadcast, Foliar | WP, WDG | 0.0744-0.075 | 1 | 0.0744 | NS | NS |
| COLE CROPS | Broadcast, Foliar | WP | 0.0744-0.075 | 5 | 0.3719 | NS | 7 |
| COTTON (UNSPECIFIED) ³ | Broadcast, Foliar | WDG, WP, L | 0.0994-0.1006 | NS, 4 | 0.3994-0.04061 | NS | 7 |
| CRABAPPLE ⁴ | Broadcast, Foliar | SC, Solid | 0.1488 - 0.15 | NS | NS | NS, 0.5438 | 12 |
| CRANBERRY | Broadcast, Foliar | WDG, WP | 0.1294-0.1313 | 2 | 0.2588-0.2625 | NS | 7 |
| CUCURBIT VEGETABLES | Broadcast, Foliar, Bloom | WDG, WP | 0.0994-0.1006 | 5 | 0.4969-0.5031 | NS | 5 |
| DECIDUOUS FRUIT TREES (UNSPECIFIED) ⁴ | Broadcast, Foliar | SC-Solid, L | 0.1488-0.1529 | NS | NS | NS, 0.5438 | 7, 12 |
| FRUITING VEGETABLES | Broadcast, Foliar | WP, WDG | 0.0744-0.075 | 4 | 0.2975-0.3 | NS | 7 |
| GRAPES | Broadcast, Foliar | WDG | 0.0994-0.1006 | 2 | 0.1988-0.2013 | NS | 14 |
| LEAFY VEGETABLES | Broadcast, Foliar | WP, WDG | 0.0744-0.075 | 5 | 0.3719-0.375 | NS | 7 |
| LEGUME VEGETABLES | Broadcast, Foliar | WDG, WP | 0.0994-0.1006 | 3 | 0.3-0.3019 | NS | 7 |
| MUSTARD | Seed Treatment | L-RTU | 0.5039 lbs ai / lbs seed | NS | NS | NS | NS |
| ONION | Broadcast, Foliar | WDG, WP | 0.1488 -0.15 | 4 | 0.5994-0.6 | NS | 7 |
| ORNAMENTAL AND/OR SHADE TREES, HERBACEOUS PLANTS | Broadcast, Foliar | L, SC-solid | 0.1488-0.1529 | NS | NS | NS, 0.5494 | 7, 12 |
| ORNAMENTAL WOODY SHRUBS AND VINES | Broadcast, Foliar | L | 0.1529 | NS | NS | NS | 7 |
| PEAR ⁴ | Broadcast, Foliar | SC-solid | 0.1488-0.15 | NS | NS | NS, 0.5438 | 12 |
| PEAS, SUCCULENT | Broadcast, Foliar | WDG, WP | 0.0994- 0.1006 | 3 | 0.3-0.3019 | NS | 7 |
| PINE SEEDLINGS | Broadcast, Foliar | L | 0.1529 | NS | NS | NS | 7 |
| POME FRUITS | Broadcast, Foliar, Pink to Bloom, | WP, WDG | 0.1488-0.15 | NS, 4 | 0.5906-0.6 | NS | 12 |

| Use Site | Application Method, Timing | Form | Max Single App. Rate (lbs ai/A) | Max # Apps / CC | Max App Rate/CC (lbs ai/A) | Max App Rate/Year (lbs ai/A) | Minimum Treatment Interval (days) |
|--|---|-------------|---------------------------------|-----------------|----------------------------|------------------------------|-----------------------------------|
| | Petal Fall | | | | | | |
| POTATO, WHITE/IRISH | Seed Treatment | L-RTU | 0.0098 lbs ai / lbs seed | NS | 0.2945 | NS | NS |
| POTATO, WHITE/IRISH, ROOT AND TUBER VEGETABLES | Broadcast, Foliar | WDG, WP | 0.744-0.075 | 4 | 0.3-0.3063 | NS | 7 |
| SMALL FRUITS | Broadcast, Foliar | WDG, WP | 0.0994-0.1006 | 2 | 0.1988-0.2013 | NS | 14 |
| SMALL FRUITS | Broadcast, Foliar | WDG, WP | 0.1294-0.1313 | 2 | 0.2588-0.2625 | NS | 7 |
| SOYBEANS (UNSPECIFIED) ⁶ | Broadcast, Foliar | FC | 0.0407 | 2 | 0.0814 | NS | 7 |
| STONE FRUITS | Broadcast, Foliar, Dormant, Delayed Dormant, Petal Fall | WDG, WP | 0.1488-0.15 | 4 | 0.595-0.6 | NS | 10 |
| STRAWBERRY | Broadcast, Foliar | WDG, WP | 0.1294-0.1313 | 2 | 0.2588-0.2625 | NS | 7 |
| TOBACCO | Broadcast, Foliar | WDG, WP | 0.0744-0.075 | 4 | 0.2975-0.3 | NS | 7 |
| TOMATO | Chemigation, Soil drench treatment | L, SC-solid | 0.0075-0.0076 lbs/plant | NS, 1 | NS | NS | NS |
| TREE NUTS | Broadcast, Foliar | SC-solid | 0.1488-0.15 | NS | NS | NS, 0.5438 | 12 |
| TREE NUTS | Broadcast, Foliar, Dormant, Delayed Dormant | WP, WDG | 0.1794-0.18 | 4 | 0.7175-0.72 | NS | 14 |

Max.=maximum; form=formulation, App=application; WDG=water dispersible granule, FC=flowable concentrate; WP=wettable powder; EC=emulsifiable concentrate; L-RTU=liquid-ready to use; SC-Solid=soluble concentrate/solid; L=liquid; cc=crop cycle; NS=not specified; A&K=attract-and-kill device

*Can be applied to all uses sites using aerial, airblast, or ground equipment, except for the seed treatment uses. The maximum number of applications per year was not specified on labels.

¹ May only be used in ID, UT, WY.

² May only be used in NV, WA, ID.

³ Some labels restrict use to CA, FL, GA, NC, SC, VA.

⁴ Only allowed for use in WA.

⁵ SC-solid may only be used in WA.

⁶ Buffer Restrictions

⁷ May only be used in OR.

EPA registration number WA110010 allows for control of apple maggot in non-agricultural quarantine and pest free areas (including residential areas) under order for Apple Maggot as Specified under WAC 16-470. The product is used on apples, crabapples, pears, ornamental plants and trees, and non-bearing fruit and nut trees. The product is applied to give the tree uniform spray coverage of the plant. The label does not have a maximum single application rate. It does indicate that the product may be applied every 12 days, up to 4 times a year, with a maximum of 0.55 lbs ai/A per year.

There are several products registered for use on a variety of sites without a specified maximum single application rate, maximum number of applications per crop cycle or year, maximum number of applications, or minimum retreatment interval.

5.3. Use on Trees

Three different labels allow for use as tree injections or basal bark treatments (EPA Reg No. 8033-94 and 8033-106) on ornamental and non-bearing fruit and nut trees. One of the labels (EPA Reg No. OR09005) is an attract-and-kill device to control carpenter worm in poplar trees. The device is applied with a string to trees where acetamiprid wettable powder is mixed with a grease and pheromone. This use is assumed to result in minimal exposure to aquatic organisms. Tree injection uses allow for 0.0024 – 0.0025 lbs ai per inch diameter at breast height (DBH). Basal bark treatments involve wetting the bark of the tree starting from a height of approximately eight feet downwards to the exposed root flair with a directed spray to completely wet the application area. Basal bark treatments recommend applications at 0.004 lbs per inch DBH of the intended target. Also recommend use of 0.15 lbs ai/36-42 total inches of treatment DBH, depending on the bark. Only single application rates are provided on the labels.

Table 5-3. Summary of Use Pattern Recommended for Control of Borers, Scale Insects, and Hemlock Wooly Adelgids in Ornamental or Non-Bearing Fruit and Nut Trees

| Use Site | Application Method | Timing | Formulation | Single Application Rate Recommendations |
|--|------------------------------------|---------------------------------------|-------------------------|--|
| Hybrid Poplar | Device applied to tree with string | Spring and Summer | Attract-and-kill Device | 0.00000265 lbs ai/A |
| Ornamental and Non-bearing Fruit and Nut Trees | Tree injection treatment | Bud break through foliar | L, SC-solid | 0.0024 - 0.0025 lbs ai/DBH |
| | Basal bark treatment | Bud break through foliar (Mid Spring) | L | NS, 0.004 lbs ai/DBH 0.15 lbs ai/ gal/36-42 DBH |

L=liquid; SC-solid=soluble concentrate, solid; DBH=diameter breast height in inches; gal=gallon

5.4. Termiticide, Ants Control, and Control of Pests

A number of products are registered for use of control of termites, ants, and various other insects

around homes, buildings, eating establishments, animal production sites, equipment, ships and boats, transportation facilities, paths, patios, and wood protection treatment, *etc.* The uses involve surface application to soils, mound treatments, drench treatments, perimeter treatments, soil injection, trenching, rodding, void treatments, spot treatments, soil excavation treatments, crack and crevice treatments, drench, bait applications, mound treatments, and insecticidal strip treatments. Some termiticide products are applied to subsurfaces into piping and reticulation delivery systems. Soil excavation involves digging up soil, treating it, and then reapplying it. Rodding involves drilling a series of holes (no more than 12 inches apart) into the ground, injecting the pesticide, and then covering the hole. Trenching (may be 6 inches deep and wide) involves digging a trench around a structure and treating the trench. Often trenching and rodding are both used in treatments. Perimeter treatment may be up to 10 feet wide around the structure and up to 3 feet high on the structure. No information was available on application intervals or maximum number of applications per year.

Table 5-4. Summary of Uses Around Buildings, Paths, Wood, and Equipment

| Application Method | Application Timing | Formulation | Maximum Single Application Rate |
|--|--|------------------|--|
| Application Rates in lbs ai/A | | | |
| Crack and crevice and/or spot treatment | When needed | SC-Solid | 0.3659 lbs ai/A |
| Soil drench treatment, spray, crack and crevice treatment, spot treatment, void treatment, perimeter treatment | When needed | SC-solid, WP, EC | 0.1829 - 0.189 lbs ai/A |
| Barrier treatment | When needed | SC-Solid | 1.1 lbs ai/A |
| Barrier treatment, soil surface treatment, barrier treatment | Postconstruction, preconstruction | WP, EC | 18.6-18.7 lbs ai/A |
| Drench | When needed | EC | 23.4 lbs ai/A |
| Application Rate per Spot | | | |
| Crack and crevice and/or spot treatment | When needed | Bait | 0.00000083 lbs ai/ spot |
| | | Bait | 0.00000165 lbs ai/ spot |
| | | Bait | 0.00000386 lbs ai/ spot |
| Applications Rates for Baits in Bait Stations | | | |
| Bait application | When needed | Bait | 0.00001531 lbs ai/ bait station |
| | | Bait | 0.00002344 lbs ai/bait station |
| Application Rates in lbs ai per linear foot | | | |
| Soil treatment (subslab injection, trenching), soil excavation, spray, void treatment | When needed, postconstruction, preconstruction | EC, WP | 0.0009 lbs ai/ linear ft |
| | | EC, WP | 0.0017 lbs ai/linear ft |
| Application Rates in lbs ai/gallon | | | |
| Crack and crevice treatment, void treatment, spot treatment, foam application, void treatment, soil injection | When needed | EC, WP, WDG | 0.0043 lbs ai / 1 gal |
| | | SC-Solid, WP | 0.105 lbs ai / 25 gal 0.1065 lbs ai /25 gal |
| Other Application Rates | | | |
| Mound Drench | Cool weather (65 - 80 | WP, EC | 0.0043 lbs ai / mound |

| Application Method | Application Timing | Formulation | Maximum Single Application Rate |
|--|--------------------|-----------------|---------------------------------|
| | F) | | 0.0086 lbs ai / mound |
| Spray, spot treatment, perimeter treatment | When needed | L-RTU, SC-solid | No dosage conversion |
| Bait application | When needed | Bait | No dosage conversion |
| Insecticidal strip treatment | When needed | IM | No dosage conversion |

L-RTU=liquid-ready to use; SC-solid=soluble concentrate-solid; IM=impregnated material; EC=emulsifiable concentrate; WP=wettable powder; gal=gallon

5.5. Usage Data

Based on market usage data from 2000-2010, usage averaged approximately 60,000 lbs ai for 900,000 acres treated resulting in an overall average application rate of 0.067 lbs ai/A (USEPA, 2012) (**Table 5-5**). The screening-level use assessment (SLUA) estimate, which only considers agricultural use, indicate that 33% of the acetamiprid used is applied to apples and cotton (20,000 lbs ai/year on average). On average 2000 to 5000 lbs of acetamiprid per year is applied to pears, oranges, lettuce, strawberries, and grapes. Based on the maximum amount of crop treated, acetamiprid is important for pears, celery, strawberries, apples, grapes, and lettuce where on average greater than 15% of these crops are treated with acetamiprid. Values are calculated by merging pesticide usage data sources together, averaging across all observations, and then rounding.

Table 5-5. Screening Level Estimates of Agricultural Uses of Acetamiprid (099050), Sorted Alphabetically

| Crop | Average Annual Pounds Active Ingredient Used on Crop | Percent Crop Treated | |
|-------------------|--|----------------------|---------|
| | | Average | Maximum |
| Alfalfa | <500 | <1 | <2.5 |
| Almonds* | <500 | <1 | <2.5 |
| Apples | 20,000 | 25 | 40 |
| Artichokes* | <500 | N/C | N/C |
| Beans, Green | <500 | <1 | <2.5 |
| Broccoli | 1,000 | 10 | 15 |
| Brussels Sprouts* | <500 | N/C | N/C |
| Cabbage | 1,000 | 10 | 15 |
| Caneberries | <500 | <2.5 | 5 |
| Cantaloupes | <500 | 5 | 15 |
| Cauliflower | <500 | 10 | 20 |
| Celery | 1,000 | 35 | 45 |
| Cherries | 1,000 | 5 | 15 |
| Chicory*+ | <500 | N/C | N/C |

| Crop | Average Annual Pounds Active Ingredient Used on Crop | Percent Crop Treated | |
|--------------|--|----------------------|---------|
| | | Average | Maximum |
| Cotton | 20,000 | 5 | 5 |
| Cucumbers | <500 | <2.5 | <2.5 |
| Grapefruit | <500 | <2.5 | 5 |
| Grapes (all) | 2,000 | 20 | 30 |
| Lemons | <500 | <2.5 | 5 |
| Lettuce | 3,000 | 15 | 30 |
| Lima Beans | <500 | <1 | <2.5 |
| Nectarines* | <500 | N/C | N/C |
| Olives*+ | <500 | N/C | N/C |
| Onions | <500 | 5 | 5 |
| Oranges | 4,000 | <2.5 | 10 |
| Peaches | 1,000 | 5 | 10 |
| Pears | 5,000 | 35 | 60 |
| Pecans | <500 | <1 | <2.5 |
| Peppers | <500 | 5 | 15 |
| Pistachios | <500 | <1 | <2.5 |
| Potatoes | 1,000 | <2.5 | <2.5 |
| Prunes | <500 | 5 | 5 |
| Pumpkins | <500 | 5 | 5 |
| Spinach | <500 | 10 | 20 |
| Squash | 1,000 | <2.5 | <2.5 |
| Strawberries | 3,000 | 30 | 50 |
| Tobacco | <500 | <1 | <2.5 |
| Tomatoes | 1,000 | 5 | 10 |
| Walnuts | 1,000 | 5 | 10 |
| Watermelons | <500 | <1 | <2.5 |

All numbers rounded.

<500 Less than 500 pounds of active ingredient

<2.5 Less than 2.5 percent of crop treated

<1 Less than 1 percent of crop treated

N/C Only lbs.ai available

* Based on CA DPR data only (valid because 95% or more of U.S. acres grown are in California)

+ Crops not known to be listed on active end use product registrations or as Section 18 emergency exemptions when this report was run

SLUA data sources include:

USDA-NASS (United States Department of Agriculture's National Agricultural Statistics Service)

Private Pesticide Market Research

California DPR (Department of Pesticide Regulation)

Figure 5-1 spatially represents acetamiprid agricultural use intensity in the U.S.; use intensity is highest in parts of the Southwest (CA and AZ), Northwest (WA and OR), and Northeast (NY, PA, and MI).

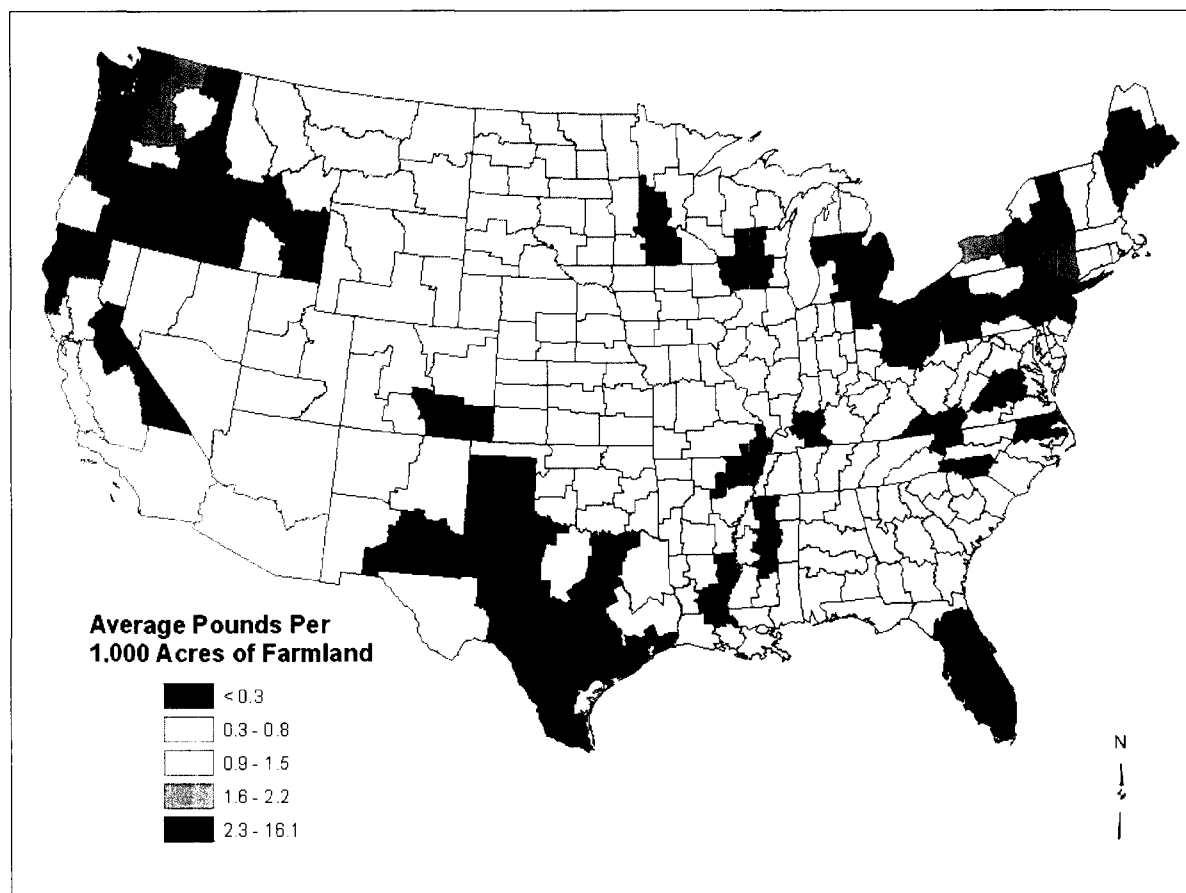


Figure 5-1. Average Pounds Acetamiprid Used by Crop Reporting District (2006-2010).⁸

⁸ This map was developed by BEAD (USEPA, 2012). This is a map of agricultural pesticide usage at the Crop Reporting District (CRD) level; CRDs are aggregates of counties created by USDA NASS (USDA, 2010). Pesticide usage is displayed as average pounds (for the years 2006-2010) per 1,000 acres of farmland in a CRD to normalize for the variation in farmland between CRDs. Farmland acreage was obtained from USDA (2007).

Usage is based on private market surveys of pesticide use in agriculture (Proprietary Data, 2006-2010). The survey data are limited to the states that represent the top 80-90% of acreage for the individual crops; therefore, use may be occurring in regions outside the scope of the survey. CRDs showing no usage of pesticides may be due to either the lack of pesticide use in the region or non-participation in the agricultural surveys. In addition, across the years, there may be variations in the specific crops included in the CRD survey. This may result in a lower annual average for the CRD.

Sources: Proprietary Data, 2006-2010; USDA NASS Crop Reporting Districts, 2006-2010; USDA Census of Agriculture, 2007.

6. Environmental Fate and Transport

6.1. Summary

Acetamiprid may enter the environment via spray directly onto soil or foliage, via spreading of bait on surfaces, or via injection into soil and building foundations. It may move off-site via spray drift, leaching, and runoff. Acetamiprid is considered nonvolatile from dry non-adsorbing surfaces, water, and moist soil. It is not likely to bioconcentrate in aquatic or terrestrial organisms. Chemicals with half-lives greater than 60 days in soil, water, and sediment are considered persistent (USEPA, 2008b); therefore, aerobic aquatic and soil metabolism half-lives for acetamiprid indicate that acetamiprid is not persistent. However, there is uncertainty in the half-lives due to significant amounts of unextracted, unidentified residues in the metabolism studies. If these unidentified residues were found to be parent, then the compound would be classified as persistent.⁹ Primary routes of degradation are via aerobic soil and aerobic aquatic metabolism. Acetamiprid is stable to hydrolysis at 25°C and aqueous photolysis is not an important degradation pathway. Acetamiprid is classified as moderately mobile using the FAO classification system ($K_{ocS} = 157\text{--}298$ L/kg organic carbon) and may be transported into surface and ground water. Acetamiprid has nine (excluding carbon dioxide) identified degradates, five of which are major degradates. Four of the five major degradates have the pyridylmethamine structure and one minor degradate contains both the pyridylmethamine structure and the cyano group of the parent. Residues of concern for human health drinking water were identified by the Health Effects Division to be the parent only. Residues of concern for aquatic organisms were determined to be the parent and IM 1-4¹⁰ by the Environmental Fate and Effects Division. As some of the unextracted residues may be the parent compound or IM 1-4, unextracted residues were determined to be a residue of concern for both human health drinking water and aquatic organisms by the Environmental Fate and Effects Division.

Acetamiprid has a log dissociation constant (pK_a) of 0.7 for the protonated form, indicating that its form will not change significantly at environmentally relevant pH values. The vapor pressure, air-water partition coefficient (K_{AW}), and ratio of acetamiprid concentration in moist soil to acetamiprid concentration in air ($C_{\text{water+soil}}/C_{\text{air}}$) indicate that it is nonvolatile from dry non-adsorbing surfaces, water, and moist soil using OPPTS^{11,12} Guideline 835.6100 classifications. The log octanol-water partition coefficient ($\log K_{ow}$) is 0.08 at 25°C and the log octanol-air partition coefficient ($\log K_{OA}$) is 12.5 indicating it is not likely to bioconcentrate in aquatic or terrestrial organisms (Armitage and Gobas, 2007; Gobas *et al.*, 2003; USEPA, 2009c).

Table 6-1 summarizes the identity information and physical-chemical properties of acetamiprid. **Table 6-2** summarizes other environmental fate data for the parent and provides half-lives for the

⁹ Data indicates that some of the unextracted residues are unlikely to be parent; however, it is unknown what portion is parent and what portion is not.

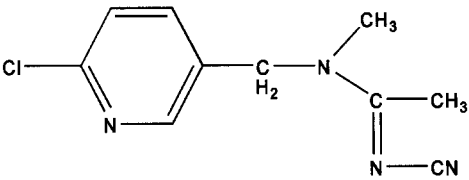
¹⁰ IM-1-4 retains the pyrimidylmethamine structure of the parent.

¹¹ Office of Prevention, Pesticides, and Toxic Substances (OPPTS) is now the Office of Chemical Safety and Pollution Prevention (OCSPP); however, the guidelines still reference OPPTS and so the guidelines are referenced with OPPTS in this document.

¹² A list of all OPPTS Guidelines discussed in this document is available in Appendix D.

parent and unextracted residues. **Table 6-6** summarizes half-lives for the parent alone, residues of acetamiprid and IM 1-4, and residues of acetamiprid, IM 1-4, and unextracted residues. All of these half-life values are used to characterize estimated environmental concentrations (EECs) in water.

Table 6-1. Summary of physical-chemical properties of acetamiprid

| Parameter | Value | Source | Comments |
|--|--|---|---|
| PC Code | 099050 | None | None |
| CAS Number | 135410-20-7 | (USNLM, 2009) | None |
| Structure |  | | None |
| Chemical Name | N ¹ -[(6-chloro-3-pyridyl)methyl]-N ² -cyano-N ¹ -methylacetamidine | MRID 44651803 | None |
| Molecular Weight | 222.68 | MRID 44651803 | None |
| Water Solubility | 4250 mg/L (25°C) | MRID 44651811 | None |
| Vapor Pressure | <1 x 10 ⁻⁸ Torr at 25°C | MRID: 46235701 | Nonvolatile from dry non-adsorbing surfaces (USEPA, 2010a) |
| | 7.50 x 10 ⁻¹⁰ Torr at 25°C 1 X 10 ⁻⁴ mPa at 25°C | (AERU, 2012) | |
| Henry's Law constant | 5.2 x 10 ⁻¹⁴ atm-m ³ /mol at 25°C (estimated) | (Estimated from vapor pressure and water solubility at pH 7 and 20°C) | Calculated with vapor pressure reported by AERU (2009). |
| Dissociation Constant (pKa) | 0.7 at 25°C | (USEPA, 2002) | None |
| Log K _{OW} | 0.8 at 25°C | MRID 44651883 | Not likely to bioconcentrate (USEPA, 2010a) |
| Air-water partition coefficient (K _{AW}) | 2.11 x 10 ⁻¹² (log K _{AW} = -11.68) | Calculated ¹ | Non-volatile from water (USEPA, 2010a) |
| Octanol-air partition coefficient (K _{OA}) | 3.0 x 10 ¹² (log K _{OA} = 12.5) | Calculated ¹ | Not likely to biomagnify in terrestrial food chains ² (Gobas <i>et al.</i> , 2003; USEPA, 2009c) |
| C _{water+soil} /C _{air} | 2.63 x 10 ¹¹ to 2.02 x 10 ¹² | Calculated ¹ | Non-volatile from moist soil (USEPA, 2010a) |

¹All estimated values were estimated according to "Guidance for Reporting on the Environmental Fate and Transport of the Stressors of Concern in Problem Formulations for Registration Review, Registration Review Risk Assessments, Listed Species Litigation Assessments, New Chemical Risk Assessments, and Other Relevant Risk

Assessments” (USEPA, 2010a).

² A recent FIFRA Scientific Advisory Panel (SAP) reported, “Gobas *et al* (2003) concluded that chemicals with a $\log K_{OA} > 5$ can biomagnify in terrestrial food chains if $\log K_{OW} > 2$ and the rate of chemical transformation is low. However, further proof is needed before accepting these limits without reservations” (USEPA, 2009c). This was also supported by Armitage and Gobas’s work completed in 2007 (Armitage and Gobas, 2007).

Table 6-2. Summary of environmental fate and transport properties of acetamiprid⁶

| Parameter | Value(s) | Source / Study Classification | Comments |
|--|---|--|--|
| Hydrolysis ³ (days) | Half-life, linear regression ¹ : Stable (pH 5, 7, 9 at 25°C) 50.8 (pH 9 at 35°C) 12.8 (pH 9 at 45°C) | MRID 44651876 Acceptable | None |
| Atmospheric Degradation (days) | Half-life: 0.140 (estimated) | (USEPA, 2009b) NA | Estimated Hydroxyl Radical Reaction Half-life for a 12-hour day; 1.5×10^6 OH molecules/cm ³ Using EPIWeb Version 4.0 |
| Aqueous Photolysis Half-life (days) | Half-life, linear regression ¹ : 34 ² (pH 7, 25°C) | MRID 44988509 Acceptable | None |
| Soil Photolysis Half-life ⁴ | No half-lives available | MRID 48563501 Supplemental – not for use in modeling | Microbial activity was higher in the dark control than in the irradiated samples and the degradation was faster in the dark control. As soil photolysis did not occur at a faster rate than microbial degradation, photolysis will not be a major route of degradation when microbial degradation is occurring. It is not known whether degradation was faster in the dark control due to the differences microbial activity. The study provides evidence on degradation products that may be observed with irradiation. |
| Aerobic Soil Metabolism Half-life (days) | Half-life, nonlinear regression ¹ at 20°C: Parent Only: 1.1, sandy loam 1.2, clay loam 1.0, clay loam Parent+Unextracted Residues 76, sandy loam 75, clay loam 99, clay loam | MRID 46255603 Supplemental – May be used in modeling | Only one replicate. Unextracted residues made up <1 to 31 % of applied radioactivity. |

| Parameter | Value(s) | Source / Study Classification | Comments |
|---|--|---|---|
| | Half-life, nonlinear regression ¹ at 20°C: Parent Only: 2.8, sandy loam 0.90, silty clay loam 6, clay loam Parent+Unextracted Residues: 10, clay loam | MRID 44651881 Supplemental – May be used in modeling | Unextracted residues made up approximately 20-40% at the end of the study (182 days); however, unextracted residues were not observed until most of the parent had degraded in the silty clay loam and sandy loam suggesting that the unextracted residues were not the parent compound. ⁵ |
| | Half-life, nonlinear regression ¹ at 20°C: Parent Only: 1.4, loamy sand Parent+Unextracted Residues: 2.0, loamy sand | MRID 44699101 Supplemental – May be used in modeling | Unextracted residues ranged from 2 to 17% of applied radioactivity. The identity of the unextracted residues is not known. |
| | Half-life, linear regression ¹ at 25°C: Parent Only: 0.3, loamy sand | MRID 44651880 Supplemental – Not for use in modeling | Not conducted under GLP. Unextracted residues were high (up to 14%) |
| | Half-life, linear regression ¹ at 25°C: Parent Only: 3.5, loamy sand Parent+Unextracted Residues: 6.4, loamy sand | MRID 44651879 Acceptable | Biphasic degradation was observed with an initial 3.6 day half-life followed by a 75 day half-life. Unextracted residues were up to 20%. |
| Anaerobic Soil Metabolism Half-life (days) | No half-lives available | MRID 48554501 Supplemental- Not for use in modeling | Dissolved oxygen concentrations ranged from 1.87-1.94 mg/L, indicating system was not fully anaerobic. Data on degradates can be used as the environment is expected to occur in natural systems. ⁷ |
| Aerobic Aquatic Metabolism Half-life (days) | Half-life, nonlinear regression ¹ at 25°C: Parent Only: 25, loamy sand sediment Parent+Unextracted Residues: 74, loamy sand sediment | MRID 44988513 Acceptable | Maximum of 38% unextracted residues. The identity of the unextracted residues is not known. Data available for only one sediment. |

| Parameter | Value(s) | Source / Study Classification | Comments |
|---|--|-------------------------------|---|
| Anaerobic Aquatic Metabolism Half-life (days) | Half-life, linear regression ¹ at 25°C: Parent Only: 325, loamy sand sediment Parent+Unextracted Residues: 568, loamy sand sediment | MRID 44988512 Acceptable | Data available for only one sediment. |
| Solid-water distribution coefficient (K_d) in L/kg | Average K_d at 20°C 0.39, loamy sand, pH 4.4 3.9, loamy sand II, pH 6.2 1.1, silt loam, pH 6.6 3.5, clay, pH 7.5 4.1, sandy loam sediment, pH 5.6 Mean = 2.60 (standard deviation=1.72) | MRID 44651883 Acceptable | Coefficient of variation is 66%. |
| Freundlich solid-water distribution coefficient (K_F) in L/kg | K_F (1/n) at 20°C Parent: 0.33 (0.85), loamy sand, pH 4.4 3.0 (0.82), loamy sand II, pH 6.2 1.0 (0.90), silt loam, pH 6.6 3.2 (0.91), clay, pH 7.5 3.2 (0.83), sandy loam sediment, pH 5.6 | MRID 44651883 Acceptable | Sorption was dependent on concentration in some soils. |
| Organic-carbon normalized distribution coefficient (K_{oc}) in L/kg _{organic carbon} | Average K_{oc} at 20°C 157, loamy sand, pH 4.4 266, loamy sand II, pH 6.2 251, silt loam, pH 6.6 298, clay, pH 7.5 164, sandy loam sediment, pH 5.6 Mean = 227 (standard deviation=63.26) | MRID 44651883 Acceptable | Coefficient of variation is 28%. The coefficient of variation is less than that for K_d values indicating that K_{oc} values will be better at predicting sorption across soils than K_d values. Moderately mobile according to FAO classification. |
| Terrestrial Field Dissipation Half-life (days) | Half-life, nonlinear regression ¹ : 2.8, CA, Gilman loamy fine, Vinca rosea 14.1, FL, Astatula fine, tree ferns 4.2, NJ, Penn silt loam, garden mums | MRID 44988514 Supplemental | Wettable powder 70% ai (EXP80667A 70WP). Degradate IM 1-2 converted to IM 1-4 in storage stability study and IM 1-4 was not stable. Residues in plants were not reported. Broadcast at 0.15 lbs ai/A with four applications. Parent was not detected below 15 cm. ECM/ILV for soil are 44988516/44988517. |

| Parameter | Value(s) | Source / Study Classification | Comments |
|---|--|---|--|
| | Half-life, linear regression ¹ : 3, WA, Timmerman coarse sandy loam, apples 6, FL, Candler sand soil, oranges 13, NY, Oakville loamy fine sand, cabbage 6, CA, Romona loam soil, cotton | MRID 44988515 Supplemental | Wettable powder 70% ai (EXP80667A 70WP). Degradate IM 1-2 converted to IM 1-4 in storage stability study and IM 1-4 was not stable. Residues in plants were not reported. Broadcast at 0.15 lbs ai/acre with four applications. Parent was not detected below 15 cm. Conditions not favorable to leaching. Subset of data used to estimate half-life for FL and WA site. ECM/ILV for soil are 44988516/44988517. |
| | Half-life, linear regression ¹ : 10.1, Prince Edward Island, Alberry sandy loam 5.2, Ontario, London loam 17.8, Manitoba, Ryerson clay loam | MRID 44988625 Supplemental | Wettable powder 70% ai (EXP61486A). Pan evaporation data were not reported so water balances could not be determined. Storage stability data were not submitted for the test site soils. Acetamiprid was applied four times at 168 g ai/ha with a 7 day interval to bare plots in Canada. Parent not detected below 15 cm depth. ECM/ILV for soil are 44988516/44988517. |
| Environmental Chemistry Methods and Independent laboratory Validation | LC/MS/MS for detection of acetamiprid, IM 1-2, IC-0 in soil | MRID 44988516/ 44988517 Satisfactory | Acetamiprid, IC-0, IM 1-4 LOD = 3.33 µg/kg-soil Acetamiprid, IM 1-2, IC-0, IM-1-4 LOQ = 10 µg/kg-soil |
| | HPLC-UV for parent, IC-0, IM 1-4, IM 1-2 in water | MRID 44988536 | LOD = 0.033 µg/L LOQ=0.1 µg/L |

¹ Degradation kinetics were calculated using the single first order decay equation using either nonlinear regression of non-transformed data or linear regression of natural log transformed data.

² Value corrected to represent natural sunlight at 40°N latitude.

³ MRID 44651877 is supplemental. A material balance was not conducted in the study; however, the results suggest that degradates IM-1-4 and IC-0 are stable.

⁴ MRID 44988508 is unacceptable.

⁵ This indicates that the unextracted residues were not the parent compound. Unextracted residues in the clay loam appeared as the parent was lost the identity of unextracted residues is unknown.

⁶ This table shows half-lives for the parent and parent plus unidentified unextracted residues which may or may not be the parent. These values are relevant in understanding the uncertainty in data due to unextracted residues. **Table 6-6** summarizes half-lives calculated for acetamiprid plus IM 1-4 plus unextracted residues which will be used in the calculation of modeling inputs in the ecological risk assessment.

⁷ Unextracted residues were at a maximum of 36.1% in the clay loam and 30% in the sandy loam soil. The identity of the unextracted residues is not known. Data only available on two soils. Results on four soils are recommended.

6.2. Degradation/Transformation of Parent

The persistence of acetamiprid is uncertain because a large portion of residues in the metabolism studies were unidentified; however, the overall evidence suggests it is not persistent in aerobic systems. Aerobic soil metabolism rates for the parent alone and for the parent and unextracted

residues in some soils indicate acetamiprid is not persistent.¹³ However, if it is assumed that all of the unextracted residues are the parent compound, acetamiprid would be considered persistent in some systems. Evidence suggests that not all of the unextracted residues are the parent compound; however, it is unknown what portion of the unextracted residues are parent and what portion are not. As many of the values considering both parent and unextracted residues are lower than 10 days; it is likely that acetamiprid is not persistent in aerobic systems. Under anaerobic aquatic conditions acetamiprid is persistent.

Acetamiprid was stable to hydrolysis at 25°C and pH 5, 7, and 9; however, hydrolysis was observed at pH 9 at 35 and 45°C (MRID 44651876). The aqueous photolysis half-life of 34 days indicates that aqueous photolysis is a minor degradation pathway (MRID 44988509). Rates of soil photodegradation are not available.¹⁴

The primary route of degradation for the parent compound is aerobic soil metabolism. There is uncertainty in the degradation of acetamiprid due to high levels of unextracted residues in metabolism studies. Therefore, to assess the impact of this uncertainty on the risk assessment, degradation rates were estimated in two ways: for the measured parent by itself, and for measured parent plus unextracted residues under the assumption that unextracted residues are also parent compound or are a residue of concern. Half-lives were also calculated for these combinations along with N-methyl(6-chloro-3-pyridyl)methylamine (IM 1-4) because the IM 1-4 degradate is considered a residue of concern for aquatic organisms; IM 1-4 is not considered a residue of concern for human health drinking water residues. In nine soils, aerobic soil metabolism rates for the parent ranged from <1 day to 6 days for the parent alone, and from 2 to 99 days for the parent plus unextracted residues. This difference in half-lives is environmentally relevant and impacts the EECs and EDWCs (see Section 14.1.B for more discussion). Anaerobic soil metabolism half-lives are not available. Aerobic aquatic metabolism rates were slower than aerobic soil metabolism rates. The aerobic aquatic half-life was 25 days for the parent, and 74 days for parent plus unextracted residues in one sediment (MRID 44988513). Anaerobic aquatic metabolism was much slower, with a half-life of 325 days in a loamy sand sediment (MRID 44988512). Examination of aerobic aquatic and anaerobic aquatic metabolism in two sediments representative of intended use sites are recommended by OPPTS Guideline 835.4300; however, data are only available on one sediment for both of the studies.

6.3. Field Dissipation

The terrestrial field dissipation of acetamiprid was studied at seven U.S. sites on various crops, and on bare ground plots at three sites in Canada. The application rate used in all studies was 0.15 lbs ai/A. This is lower than the maximum single application rate for use on citrus--0.25 lbs ai/A/single application, which has the highest single application rate among agricultural uses, a maximum of five applications/season, and a maximum of 0.55 lbs ai/A/season (several other

¹³ International half-lives that are considered persistent in soil, water, and sediment range from greater than 60 days to greater than 365 days (USEPA, 2008b).

¹⁴ A soil photolysis study (MRID 48563501) is available; however, data were insufficient to determine the rate of soil photolysis.

fruit and nut tree crops have similar or slightly higher seasonal application rates). The dissipation half-lives for acetamiprid applied to domestic food, fiber and ornamental crops ranged from three to 14 days for residues in 0 to 15 cm (MRIDs 44988514, 44988515). The dissipation half-lives for acetamiprid applied to bare ground plots (determined in Canadian soils) ranged from five to 18 days (MRID 44988625). The submitted studies generally met guideline requirements. However, because the degradate IM 1-2 converts to IM 1-4 in frozen storage within a short period of time (approximately 1 month), and many of the samples were stored for much longer periods of time (over 600 days, lengths of storage for which storage stability data were not reported) prior to analysis, the patterns of formation and decline could not be determined accurately for these major degradates. Also, at several of the study sites, negative water balances (*i.e.*, greater evaporation/total water loss from the soil than the total water input) following the final application likely precluded the possibility of significant leaching. Soil characteristics and results of the field studies are presented in **Table 6-3**. All reported maximum values for degradates in **Table 6-3** are for the period following the final application and represent individual replicates (U.S. sites) or replicate means (Canadian sites) from the 0- to 15-cm depth. The degradate IM 1-4 frequently had higher maximum concentrations in soils than the parent. In the studies conducted on cropped sites, IM 1-4 was detected at its maximum levels generally within two weeks of application. These IM-1-4 conclusions are uncertain because of the storage stability issue.

Table 6-3. Summary of Terrestrial Field Dissipation Study Results For Acetamiprid

| MRID | Soil Texture | Study Site, Crop | Half-life in days | Max. Depth of Leaching | Maximum Concentration Observed in Soil ($\mu\text{g/kg-soil}$) | | | |
|----------|--------------|------------------|-------------------|------------------------------------|--|---------------------|---------------------|-----------------|
| | | | | | Acet. | IM 1-4 ² | IM 1-2 ² | IC-0 |
| 44988515 | sandy loam | WA, apples | 3 | 0-15 cm (a,b,c) ³ | 148 | 149 | 29 | ND ⁴ |
| 44988515 | sand | FL, oranges | 6 | 0-15 cm (a, b) | 77 | 60 | ND | ND |
| 44988515 | loamy sand | NY, cabbage | 13 | 0-15 cm (a, b) | 107 | 197 | ND | ND |
| 44988515 | loam | CA, cotton | 6 | 0-15 cm (a, b, c); 15-30 cm (d) | 68 | 202 | 20 | 18 |
| 44988514 | loamy sand | CA, vincarosea | 3 | 0-15 cm (a, b, c); 30-45 cm (d) | 46 | 425 | 26 | 45 |
| 44988514 | sand | FL, tree ferns | 14 | 0-15 cm (a, b, d) | 151 | 147 | ND | 12 |
| 44988514 | silt loam | NJ, garden mums | 4 | 0-15 cm (a, b, d) | 96 | 191 | ND | 23 |

| MRID | Soil Texture | Study Site, Crop | Half-life in days | Max. Depth of Leaching | Maximum Concentration Observed in Soil (µg/kg-soil) | | | |
|----------|--------------|------------------------------------|-------------------|------------------------|---|-------|------|------|
| | | | | | | | | |
| 44988625 | sandy loam | Prince Ed. Isl., CAN., Bare ground | 10 | 0-15 cm (a, b, c, d) | 331 | 135.0 | 17.0 | 14.5 |
| 44988625 | loam | Ontario, CAN. | 5 | 0-15 cm (a, b, c, d) | 202.5 | 82.0 | 87.5 | 34.5 |
| 44988625 | clay loam | Manitoba, CAN., bare ground | 18 | 0-15 cm (a, b, c, d) | 209.0 | 41.0 | 68.0 | 17.5 |

¹ Acetamiprid was applied at all sites using four applications at intervals ranging from 6 to 9 days.

² IM 1-2 converts to IM 1-4 under storage conditions. IM 1-2 concentrations shown are likely to be lower than those that occurred in the field.

³ a = parent; b = IM-1-4; c = IM-1-2; d = IC-0.

⁴ ND = not detected.

6.4. Degradates/Transformation Products

Transformation products resulting from the environmental degradation of acetamiprid are:

- N-methyl(6-chloro-3-pyridyl)methylamine (IM 1-4)
- (E)-N1-[(6-chloro-3-pyridyl)-methyl]-N2-cyano-N1-methylacetamidine (IM 1-5)
- 6-chloronicotinic acid (IC-0)
- N²-carbamoyl-N¹-[(6-chloro-3-pyridyl)-methyl]-N¹-methylacetamidine (IM 1-2)
- 6-chloro-3-pyridylmethano (IM-0)
- N-[(6-chloro-3-pyridyl)methyl]-N-methylacetamide (IM 1-3)
- N-[(6-chloro-3-pyridyl)methyl]acetamide (IM 2-3)
- N¹-[(6-chloro-3-pyridyl)methyl]-N²-cyanoacetamidine (IM 2-1)
- Carbon dioxide

Structures of these degradates and the maximum percent of applied radioactivity present as the specified degradate is shown in are shown in **Table 6-4** with additional information in **Appendix A**. **Figure 6-1** provides structures and a proposed degradation pathway. In the studies containing soil or sediment, there was a significant amount of unextracted residues in many of the studies. As indicated earlier, this could result in an underestimation of the maximum amount for degradates. The degradates IM 1-4, IM 1-5, IC-0, IM 1-2, and IM 1-3 were present at greater than 10% applied radioactivity and are considered major degradates. All of these degradates except IC-0 contain the pyridylmethylamine in acetamiprid that is similar to other pyridylmethylamine nicotinoid insecticides (depicted in **Figure 6-2**) and observed in nicotine, which acts on the nicotinic acetylcholine receptor (Tomizawa and Casida, 2005). Degradates IM 1-4, IM 1-5, and IM 1-3 were also relatively stable with peaks observed at the final sampling interval or high levels observed in studies over long durations. While IM-1-3 is relatively stable and is considered a major degradate based on the hydrolysis study (pH 9 with 35°C and 45°C), it was only detected at maximums of 3-8% in the metabolism studies. Maximum concentrations of IM 1-4 were often higher than maximum concentrations of parent observed in the terrestrial field

dissipations studies (see **Table 6-3**). Toxicity data on transformation products are discussed in Section **Table 8-4** and **Table 8-7**. Stressors of concern are identified in Section 9.

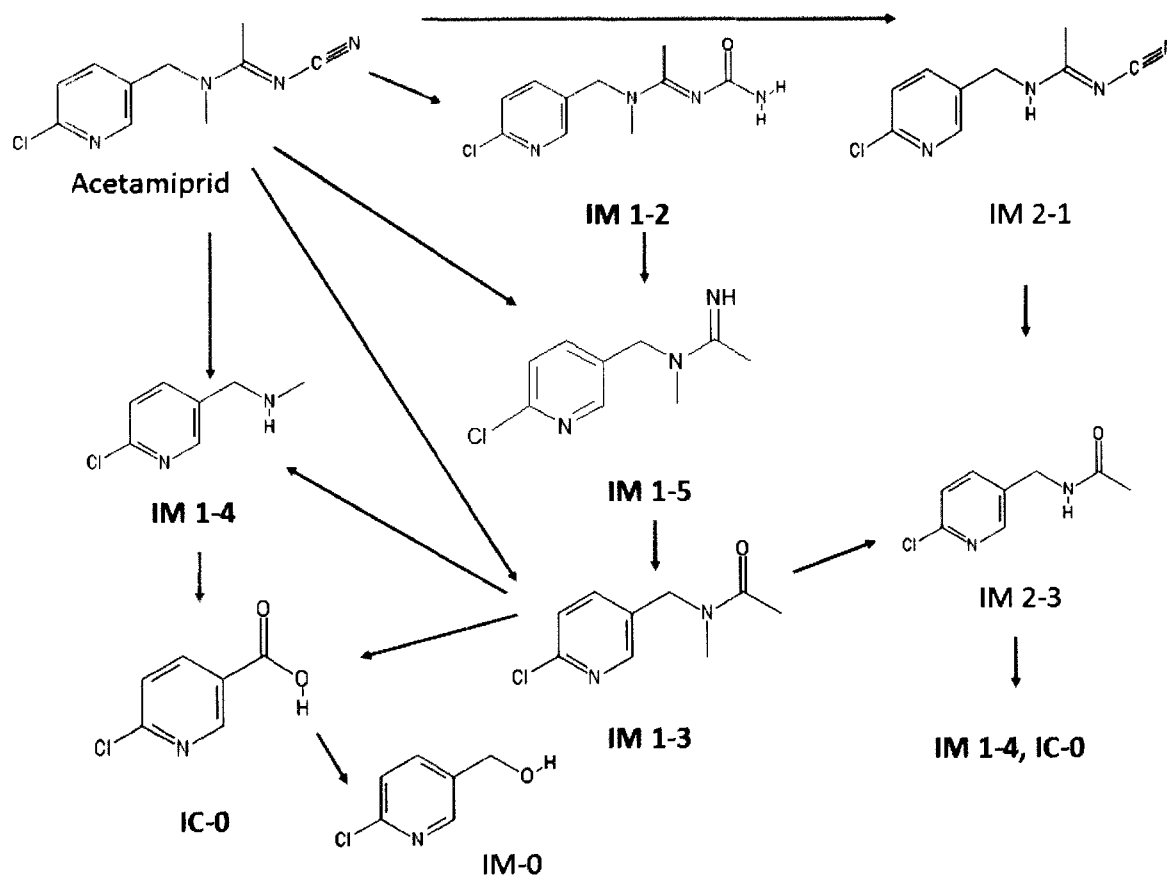


Figure 6-1. Potential Degradation Pathway for Acetamiprid. Bold degradates had greater than 10% applied radioactivity associated with the compound in at least one submitted fate study.

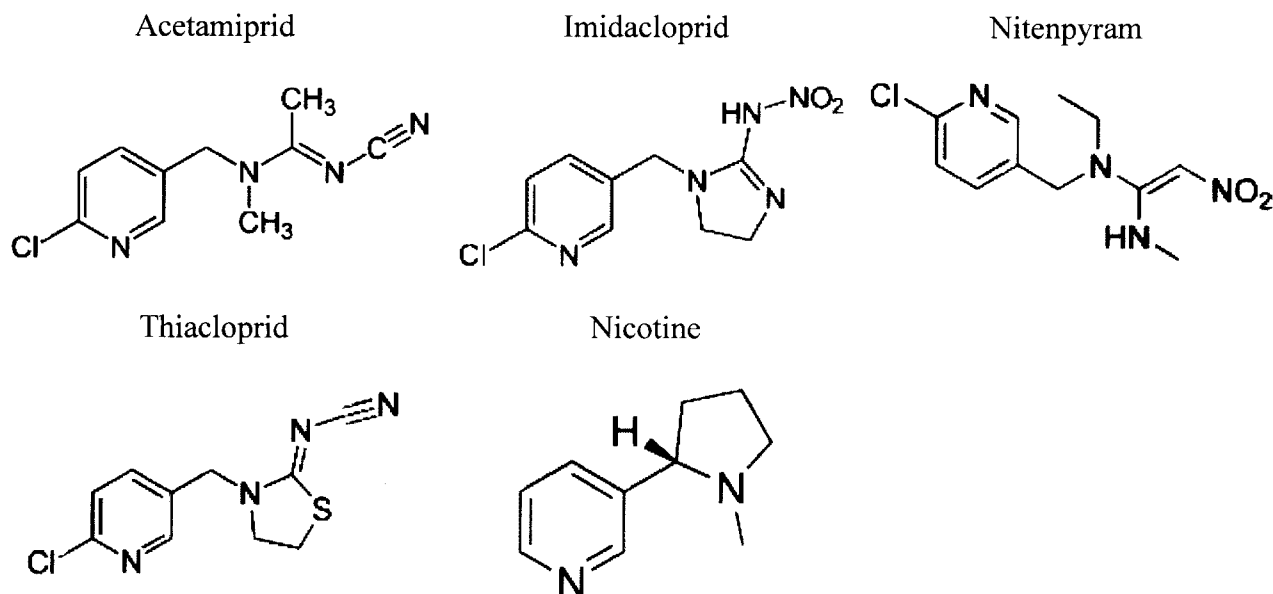


Figure 6-2. Structure of Pyridylmethylaniline Nicotinoid Insecticides and Nicotine

The 2009 new use assessment for acetamiprid identified IM 1-4 as a residue of concern for aquatic animals and it was assumed to have similar toxicity to the parent (USEPA, 2009, D364328). The only residue of concern for human health drinking water is the parent compound. **Table 6-6** provides the half-lives estimated for parent with IM 1-4 and parent with IM 1-4 plus unextracted residues. Hydrolysis and aqueous photolysis data for IM 1-4 indicate it is stable to these degradation processes and that IM 1-4 has sorption coefficients similar to those of the parent (**Table 6-2**). Aerobic soil metabolism data show that residues of IM 1-4 were detected at high levels throughout the study for many of the soils with residues in three soils indicating that IM 1-4 was stable to aerobic soil metabolism.¹⁵ The maximum depth that IM 1-4 was detected in terrestrial field dissipation studies was 15 cm. **Appendix A** contains additional environmental fate data submitted on IC-0.

¹⁵ Three studies indicate that IM-1-4 is relatively stable to aerobic soil metabolism in some soils. In the aerobic soil metabolism study discussed in MRID 44651879, percent applied radioactivity associated with IM-1-4 was 73% at 120 days and 60% at 365 days. In the aerobic soil metabolism study discussed in MRID 44651881 on a clay loam soil at 10°C, percent applied radioactivity associated with IM-1-4 was 73% at 30 days and 54% at 178 days. In the same study (MRID 44651881) and soil (clay loam) at 20°C, percent applied radioactivity was 56% at 14 days and 37% at 182 days.

Table 6-4. Summary of Maximum Degradate Amounts in Environmental Fate Studies of Acetamiprid^d

| Compound | Maximum Degradate % of Applied Radioactivity Associated with Compound (Time of Peak) Amount Detected at Final Sampling Interval in Corresponding Study | | | | | | | Maximum Concentration in Terrestrial Field Dissipation (µg/kg soil) |
|----------|---|-----------------------|--------------------------|----------------------------|--------------------------|----------------------------|---------------------------|---|
| | Hydrolysis | Aqueous Photolysis | Soil Photolysis | Aerobic Soil | Anaerobic Soil | Anaerobic Aquatic | Aerobic Aquatic | |
| IM 1-4 | 15 (35 d)a 15 (35 d)a | ND | 32 (24 d)a 32 (24 d)a | 73 (120 d)c 61 (365 d)c | 64 (61 d) 61 (125 d) | 27 (270 d)a 27 (270 d)a | 64 (60 d)c 34 (300 d)c | 425 |
| IM 1-5 | NA | ND | NA | 22 (13 d)a 13 (182 d)b | NA | NA | NA | NA |
| IC-0 | NA | ND | 16 (24 d)a 16 (24 d)a | 12 (7 d) ND (182 d) | 3 (125 d)a 3 (125 d)a | ND | 19 (180 d) ND (300 d) | 45 |
| IM 1-2 | NA | ND | 1 (7 d) ND (24 d) | 55 (7 d) ND (182 d) | 4 (5 d) ND (125 d) | 1 (90 d) ND (365 d) | 21 (30 d) <1 (300 d) | 88 |
| IM-0 | NA | ND | ND | 2.21 (7 d) ND (187 d) | 2 (1 d) ND (125 d) | NA | NA | NA |
| IM-1-3 | 61 (35 d)a 61 (35 d)a | ND | 4 (24 d)a 4 (24 d)a | 3 (60 d) <1 (365 d) | 3 (5 d) 3 (125 d)a | 8 (180 d) 6 (365 d) | 1 (90 d) ND (300 d) | NA |
| IM-2-1 | NA | NA | 3 (17 d) 2 (24 d) | NA | ND | NA | NA | NA |
| IM-2-3 | NA | NA | ND | NA | 2 (5 d) ND (125 d) | NA | NA | NA |

NA=not analyzed; ND=not determined

a Peak at final sampling interval in some studies

b Peak at final sampling interval in some soils

c High levels observed for > 100 days.

d See **Appendix A** for more information on source of information in this table.

Table 6-5. Summary of environmental fate and transport properties of the acetamiprid degradate IM-1-4

| Parameter | Value(s) | Source/ Study Classification | Comments |
|---|--|---|---|
| Hydrolysis (days) | Stable (pH 4, 7, 9 at 50°C) | MRID 44651877 Supplemental | Study duration was five days and at 50°C. Greater than 99% of applied residues were IM-1-4 at the end of the study. |
| Aqueous Photolysis Half-life (days) | Stable (pH 7, 25°C) | MRID 44988511 Valid | None |
| Aerobic Soil Metabolism | Slow degradation | See results from studies conducted on parent | High levels observed for > 100 days |
| Aerobic Aquatic Metabolism | Slow degradation | | Peak observed at study termination |
| Anaerobic Soil Metabolism | Stable | | Little degradation over more than 60 days |
| Anaerobic Aquatic Metabolism | Stable | | |
| Solid-water distribution coefficient (K_d) in L/kg | Average K_d at 20°C 0.38, loamy sand , pH 4.4 6.48, loam sand II, pH 6.4 5.63, silt loam, pH 6.6 21.9, clay, pH 7.5 4.08, sandy loam sediment, pH 5.6 Mean = 7.69 (standard deviation=8.28) | MRID 44651885 Valid | Coefficient of variation is 108%. |
| Freundlich solid- water distribution coefficient (K_F) in L/kg | K_F (1/n) at 20°C 0.29, loamy sand , pH 4.4 5.35, loam sand II, pH 6.4 4.34, silt loam, pH 6.6 17.0, clay, pH 7.5 2.84, sandy loam sediment, pH 5.6 Mean = 5.97 (standard deviation=6.45) | MRID 44651885 Valid | Sorption was dependent on concentration in some soils. All 1/n values were less than 0.90. |

| Parameter | Value(s) | Source/ Study Classification | Comments |
|---|--|------------------------------------|--|
| Organic-carbon normalized distribution coefficient (K_{oc}) in L/kg _{organic carbon} | Average K_{oc} at 20°C 153, loamy sand , pH 4.4 440, loam sand II, pH 6.4 1278, silt loam, pH 6.6 1842, clay, pH 7.5 163, sandy loam sediment, pH 5.6 Mean = 775 (standard deviation=753) | MRID 44651885 Valid | Coefficient of variation is 97%. The coefficient of variation is less than that for K_d values indicating that K_{oc} values will be better at predicting sorption across soils than K_d values. Moderately mobile to slightly mobile according to FAO classification. |

Table 6-6. Summary of half-lives estimated for residues of parent, IM-1-4, and Unextracted residues in metabolism studies

| Type of Study (MRID) | Study System | Half-life (days)* | | |
|------------------------------------|--------------------------|-------------------|---------------------|---------------------------------------|
| | | Parent Only | Parent + IM- 1-4 | Parent+IM-1-4+Unextracted Residues |
| Aerobic Soil (44651881) | Silty Clay Loam, 20°C | 0.9 | 1.1 | 1.1 |
| | Clay Loam, 20°C | 6 | 104 | 392 |
| | Sandy Loam, 20°C | 2.8 | 118 | 299 |
| Aerobic Soil (46255603) | Sandy Loam, 20°C | 1.1 | 2.4 | 72 |
| | Clay Loam, 20°C | 1.2 | 2.4 | 67 |
| | Clay Loam, 20°C | 1.0 | 1.7 | 84 |
| Aerobic Soil (44699101) | Loamy Sand, 20°C | 1.4 | 20 | 53 |
| Aerobic Soil (44651879) | Loamy Sand, 25°C | 3.5 | 430 | 895 |
| Aerobic Aquatic (44988513) | Loam Sand, 25°C | 25 | 215 | 658 |
| Anaerobic Aquatic (44988512) | Loamy Sand, 25°C | 325 | 590 | 1372 |

*All values were estimated using nonlinear regression and the single first order equation.

6.5. Mobility/Sorption

Acetamiprid is classified as moderately mobile with organic carbon normalized soil-water distribution coefficients (K_{oc}) ranging from 157 to 298 L/kg_{organic carbon} measured in four soils and

one sediment (MRID 44651883)¹⁶. The mean K_{oc} was 227 L/kg-organic carbon and the coefficient of variation for K_{oc} values (28%) is less than that for K_d values (66%) indicating that K_{oc} values will be better at predicting sorption across soils than K_d values. Additionally, K_d s tend to be higher as the percent organic carbon increases. There was no relationship with K_d s and pH or percent clay. Based on the sorption coefficients and persistence, acetamiprid has the potential to reach ground water, especially in vulnerable sandy soils with low organic-carbon content and/or the presence of shallow ground water. However, the maximum depth at which it was detected in terrestrial field dissipation studies was 15 cm. The mobility of the degradate IM 1-4, which is a residue of concern for aquatic organisms, is similar to the mobility of the parent. K_d values ranged from 0.38 to 21.9 L/kg-soil in four soils and one sediment and K_{oc} values ranged from 153 – 1842 L/kg-organic carbon. The mean K_{oc} for IM 1-4 (775 L/kg-organic carbon) was slightly higher than the mean K_{oc} for the parent (227 L/kg-organic carbon). Therefore, the sorption coefficients for the parent will be used in modeling.

6.6. Monitoring Data

The following databases and sources were searched on May 4, 2012 for monitoring information on acetamiprid:

- The United States Environmental Protection Agency (USEPA) STORET Database (<http://www.epa.gov/storet/dbtop.html>)
- The United States Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Program Data Warehouse (<http://infotrek.er.usgs.gov/traverse/?p=NAWQA:HOME:1405517206944567>)
- The USGS National Stream Quality Accounting Network (NASQAN) program (<http://water.usgs.gov/nasqan/>)

No monitoring data are available as none of the databases reported looking for acetamiprid.

7. Clean Water Act

Acetamiprid is not identified as a cause of impairment for any water bodies listed as impaired under section 303(d) of the Clean Water Act, based on information provided at http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.cause_detail_303d?p_cause_group_id=885. In addition, no Total Maximum Daily Loads (TMDL) have been developed for acetamiprid, based on information provided at http://iaspub.epa.gov/tmdl_waters10/attains_nation.tmdl_pollutant_detail?p_pollutant_group_id=885&p_pollutant_group_name=PESTICIDES. More information on impaired water bodies and TMDLs can be found at <http://www.epa.gov/owow/tmdl/>.

The Agency invites submission of water quality data for this pesticide. To the extent possible, data should conform to the quality standards in Appendix A of the *OPP Standard Operating Procedure: Inclusion of Impaired Water Body and Other Water Quality Data in OPP's*

¹⁶ Classification is based on the FAO classification system (USEPA, 2010a)

Registration Review Risk Assessment and Management Process (see: <http://www.epa.gov/oppfead1/cb/ppdc/2006/november06/session1-sop.pdf>), in order to ensure they can be used quantitatively or qualitatively in pesticide risk assessments.

8. Receptors

Consistent with the process described in the Overview Document (USEPA, 2004b), the risk assessment for acetamiprid will rely on a surrogate species approach. Toxicological data generated from surrogate test species, which are intended to be representative of broad groups of organisms, are used to extrapolate potential effects on a variety of species (receptors) within these groups. Categories of organisms evaluated include: fish, arthropods (insects, crustaceans), mollusks, birds, mammals, aquatic vascular and nonvascular plants, and terrestrial plants.

Acute and chronic toxicity data from studies submitted by the pesticide registrant, along with studies available in the open literature, will be used to evaluate the potential direct and indirect effects of acetamiprid on aquatic and terrestrial receptors. This includes toxicity of the technical grade active ingredient, degradates, and formulated products (*e.g.* “six-pack” acute toxicity studies). Open literature studies are identified using EPA’s publically available ECOTOX database (USEPA, 2009a)¹⁷, which employs a literature search engine for locating chemical toxicity data for aquatic life, terrestrial plants, and wildlife. The evaluation of both data sources may also provide insight into the direct and indirect effects of acetamiprid usage on biotic communities from loss of sensitive species and from changes in community structure or function.

The most sensitive endpoint for each group of organisms is used in risk assessment. Assessment endpoints include direct toxic effects on the survival, reproduction, and growth of terrestrial and aquatic life, as well as indirect effects, such as reduction in prey base and/or modification of habitat. A brief summary of the aquatic and terrestrial toxicity data available for acetamiprid and its degradates is provided in Sections 8.1 and 8.2, respectively. A more complete summary of the available data is presented in **Appendix B**. In addition, a summary of ecological incidents associated with acetamiprid is provided in Section 8.3. Additional information on degrade toxicity is discussed in Section 9.

Toxicity to fish and aquatic invertebrates is categorized using the system shown in **Table 8-1** (USEPA, 2004a). Toxicity to terrestrial fauna (birds and mammals) is categorized using the system shown in **Table 8-2**. Toxicity categories for plants have not been defined.

Table 8-1. Categories of Acute Toxicity for Aquatic Animals

| LC ₅₀ (ppm) | Toxicity Category |
|------------------------|-------------------|
| < 0.1 | Very highly toxic |
| > 0.1 - 1 | Highly toxic |
| > 1 - 10 | Moderately toxic |
| > 10 - 100 | Slightly toxic |

¹⁷ <http://cfpub.epa.gov/ecotox/>

| | |
|-------|----------------------|
| > 100 | Practically nontoxic |
|-------|----------------------|

Table 8-2. Categories of Acute Toxicity for Terrestrial Animals

| LD₅₀ (mg/kg) | LC₅₀ (ppm) | Toxicity Category |
|--------------------------------|------------------------------|--------------------------|
| <10 | <50 | Very highly toxic |
| 10-50 | 50-500 | Highly toxic |
| 51-500 | 501 - 1000 | Moderately toxic |
| 501-2000 | 1001 - 5000 | Slightly toxic |
| >2000 | >5000 | Practically nontoxic |

8.1. Effects to Aquatic Organisms

The most sensitive aquatic toxicity endpoints resulting from acetamiprid (parent) and degradate exposure based on registrant-submitted studies are provided in **Tables 8-3** and **8-4**, respectively. As long as additional information is not submitted or available in the open literature, these endpoints will be used to calculate RQ values for acetamiprid. A single aquatic toxicity study (Beketov and Liess, 2008) was available in ECOTOX as of April 20, 2012; this study will be evaluated for utility in risk assessment during the Registration Review process.

8.1.A. Acetamiprid (Parent)

(a) Fish and Aquatic-Phase Amphibians

Two acute toxicity studies of the effect of acetamiprid on freshwater fish species were submitted. The 96-hr LC₅₀ values are greater than 100 and 119 mg ai/L for the rainbow trout (*Oncorhynchus mykiss*; MRID 44651864) and bluegill sunfish (*Lepomis macrochirus*; MRID 44651863), respectively. Acetamiprid is therefore classified as practically non-toxic to freshwater fish on an acute exposure basis. Sublethal effects were noted in both studies. In rainbow trout, darkened body pigmentation, swollen abdomen, and loss of equilibrium were reported at the three highest concentrations (50, 70, 100 mg ai/L). In bluegill sunfish, darkened body pigmentation was observed in all fish at all treatments (11.8, 20.0, 35.4, 65.0, 119.3 mg ai/L). Unless more sensitive data is found in the open literature, the acute toxicity estimate for trout will be used to assess potential acute risk to freshwater fish (and aquatic-phase amphibians for which they serve as surrogates) during risk assessment.

In the only acute estuarine/marine fish study involving acetamiprid, the 96-hr LC₅₀ for the sheepshead minnow (*Cyprinodon variegatus*; MRID 44988411) is 100 mg ai/L, and lethargy was observed in all surviving fish at 90 mg ai/L. Acetamiprid is classified as slightly toxic to estuarine/marine fish on an acute exposure basis. Unless more sensitive data is found in the open literature, the acute toxicity estimate for the sheepshead minnow will be used to assess potential acute risk to estuarine/marine fish during risk assessment.

A 35-day early life stage toxicity study (MRID 44651872) of fathead minnows (*Pimephales promelas*) was submitted to evaluate the chronic effects of acetamiprid on freshwater fish. The lowest observed adverse effect concentration (LOAEC) for the study is 38.4 mg ai/L based on both decreased survival and growth (measured by weight). The no-observed-adverse-effect concentration (NOAEC) is 19.2 mg ai/L, and this will be used to estimate potential chronic risk to freshwater fish (and aquatic-phase amphibians for which they serve as surrogates) during risk assessment.

No chronic toxicity data were submitted for estuarine/marine fish. However, given the low acute toxicity to both freshwater and estuarine/marine fish and the low likelihood of adverse chronic effects to freshwater fish identified in previous assessments, the need for chronic toxicity data for estuarine/marine fish is considered low.

(b) Aquatic Invertebrates

The non-biting midge (*Chironomus riparius*; MRID 45916201) is the most sensitive freshwater aquatic invertebrate species in which acetamiprid was tested. The 48-hr LC₅₀ for the midge is 0.021 mg ai/L, and acetamiprid is therefore considered very highly toxic to freshwater invertebrates on an acute exposure basis. Acetamiprid is approximately three orders of magnitude more toxic to chironomids than to the freshwater cladoceran *Daphnia magna* (48-hr LC₅₀ = 50 mg ai/L; MRID 44651866) on an acute exposure basis. Therefore, the chironomid endpoint value will represent freshwater invertebrates during risk assessment.

Acetamiprid is also very highly toxic to mysid shrimp (*Americamysis bahia*; MRID 44651869), an estuarine/marine invertebrate, on an acute exposure basis (48-hr LC₅₀ = 0.066 mg ai/L). Sublethal effects (*e.g.*, lethargy) were observed among all the surviving mysids exposed to the 0.064 and 0.110 mg ai/L treatment levels and in at least one individual at all concentrations except the lowest (0.013 mg ai/L).

Chronic toxicity data for acetamiprid is available for *D. magna* (MRID 44651871). Survival was reduced in this species by 57%, compared to controls, at the highest test concentration (74 mg ai/L). Significant reductions in length (8%), weight (24%), and mean number of offspring (50%) were observed at 9 mg ai/L, resulting in a NOAEC of 5 mg ai/L based on reduced growth and reproduction. However, since acetamiprid is approximately three orders of magnitude more toxic to chironomids (LC₅₀ = 0.021 mg ai/L) than to daphnids (LC₅₀ = 50 mg ai/L) on an acute exposure basis, the available chronic endpoint for *D. magna* may not adequately represent chronic toxicity to more sensitive freshwater invertebrates. Therefore, an acute-to-chronic ratio (ACR) approach is used for this assessment. Since the acute daphnid endpoint is 50 mg ai/L and the chronic NOAEC is 5 mg ai/L, the ACR for this species is 10. Applying the ACR to the chironomid acute toxicity endpoint results in an estimated chronic toxicity endpoint of 0.0021 mg ai/L. This ACR value will be used to calculate chronic RQ values for freshwater invertebrates unless more sensitive data is identified in the open literature.

A chronic study with acetamiprid (MRID 44651873) was also carried out on mysid shrimp as a representative of estuarine/marine invertebrates. Reduction in male dry body weight was the

most sensitive endpoint, yielding a NOAEC of 0.0025 mg ai/L and a LOAEC of 0.0047 mg ai/L. The percent reduction in male dry weight ranged from 11 to 36% in test levels that significantly differed from the dilution control.

Although acetamiprid is registered for use as an insecticide, the high sensitivity of amphipods (acute; see **Appendix B** for endpoint data) and mysid shrimp (acute and chronic) to the chemical suggests that there is the potential for concern to a variety of aquatic invertebrates, not just insects. Characterization of the taxonomic breadth and magnitude of this potential risk will be addressed during the upcoming risk assessment.

(c) Aquatic Plants

Tier 1 toxicity testing with aquatic plants indicates that acetamiprid is not toxic at the concentrations tested (**Table 8-3**). Exposure to acetamiprid did not significantly affect growth in the single aquatic vascular plant species (*Lemna gibba*, 14-day test) and four nonvascular plants species at limit concentrations tested ranging from 1.0 to 1.3 mg ai/L.

Table 8-3. Most Sensitive Aquatic Toxicity Endpoints for Acetamiprid

| Species | Measured Effect | Duration | Endpoint | Toxicity Value mg ai/L | Test Substance % ai | MRID (Study Classification) |
|---|---|----------|------------------|----------------------------------|------------------------|-----------------------------|
| Freshwater Fish | | | | | | |
| <i>Oncorhynchus mykiss</i> (Rainbow Trout) | Mortality | 96 hours | LC ₅₀ | >100* (Practically non-toxic) | >99% | 44651864 (Acceptable) |
| <i>Pimephales promelas</i> (Fathead Minnow) | Embryo and larval survival, larval growth (wet-weight and length) | 35 days | NOAEC LOAEC | 19.2 38.4 | 100% | 44651872 (Supplemental) |
| Freshwater Invertebrates | | | | | | |
| <i>Chironomus riparius</i> (Non-biting Midge) | Mortality | 48 hours | LC ₅₀ | 0.021 (Very highly toxic) | 99.3 | 45916201 (Supplemental) |
| | Calculated Value | -- | NOAEC | 0.0021 [†] | Acute-to-chronic Ratio | -- |
| Estuarine/Marine Fish | | | | | | |
| <i>Cyprinodon variegatus</i> (Sheepshead minnow) | Mortality | 96 hours | LC ₅₀ | 100 (Slightly toxic) | 99.9% | 44988411 (Acceptable) |
| Estuarine/Marine Invertebrates | | | | | | |
| <i>Americamysis bahia</i> (Mysid shrimp) | Mortality | 96 hours | LC ₅₀ | 0.066 (Very highly toxic) | 99.9% | 44651869 (Acceptable) |
| | Reduced body weight in males | 28 days | NOAEC LOAEC | 0.0025 0.0047 | 99.9% | 44651873 (Acceptable) |

| Species | Measured Effect | Duration | Endpoint | Toxicity Value mg ai/L | Test Substance % ai | MRID (Study Classification) |
|--|-----------------|----------|------------------|---------------------------|------------------------|--------------------------------|
| Aquatic Vascular Plants | | | | | | |
| <i>Lemna gibba</i> (duckweed) | Frond number | 14 days | EC ₅₀ | >1.0* | 99.9% | 44988415 (Acceptable) |
| | | | NOAEC | 1.0 | | |
| Aquatic Non-Vascular Plants | | | | | | |
| <i>Navicula pelliculosa</i> (Freshwater diatom) | Cell density | 5 days | EC ₅₀ | >1.1* | 99.9% | 44988417 (Acceptable) |
| | | | NOAEC | 1.1 | | |
| <i>Skeletonema costatum</i> (Marine diatom) | Cell density | 5 days | EC ₅₀ | >1.0* | 99.9% | 44988418 (Acceptable) |
| | | | NOAEC | 1.0 | | |

* Non-definitive study endpoint; cannot be used to calculate RQs.

† Endpoint is estimated using the ACR of 10 calculated for *D. magna* (acute LC₅₀ of 50 mg ai/L divided by chronic NOAEC of 5 mg ai/L = 10); applying ACR to the midge acute 48-hr LC₅₀ of 0.021 mg ai/L results in estimate NOAEC of 0.0021 mg ai/L; unless additional data becomes available, this value will be used to estimate risk in upcoming Registration Review Ecological Risk Assessment.

8.1.B. Degradate Effects to Aquatic Organisms

An acute toxicity study of the degradate IM 1-4 on rainbow trout (MRID 44651865) was conducted at concentrations ranging from 4.3 to 69.3 mg ai/L (**Table 8-4**). No mortalities were reported except at the 69.3 mg ai/L test level, but this may have been due to buffering problems in the test solution, as pH levels ranged from 9.0-9.3. An additional concentration was subsequently tested under buffered conditions at 98.1 mg ai/L, and no mortality was observed. Sublethal effects, including darkened body pigmentation and surface swimming, were observed at concentrations above 4.3 mg ai/L. The 96-hr LC₅₀ is >98.1 mg ai/L, classifying the degradate IM 1-4 as either slightly toxic or practically nontoxic to freshwater fish on an acute exposure basis. The 96-hr LC₅₀ for the parent in rainbow trout (96-hr LC₅₀>100 mg acetamiprid/L) was also non-definitive.

Acute toxicity to aquatic invertebrates was evaluated for several degradates of acetamiprid. Toxicity tests on *D. magna* with degradates IC-0 (MRID 44988409), IM-1-2 (MRID 44651867), and IM 1-4 (MRID 44651868) resulted in 48-hr LC₅₀ values of >95.1, >99.8, and 43.9 mg ai/L, respectively, while the *D. magna* 48-hr LC₅₀ for the parent compound is 50 mg ai/L (MRID 44651866). This indicates that IM 1-4 has similar toxicity to the parent for freshwater aquatic invertebrates. The 48-hr LC₅₀ of IM 1-5 for the non-biting midge (MRID 46255610) is 68 mg ai/L as compared to 0.021 mg ai/L for the parent, acetamiprid.

For estuarine/marine invertebrates, the only acute toxicity test with a degradate was with IM 1-4 on mysid shrimp (MRID 44651870), resulting in a 96-hr LC₅₀ of 19 mg ai/L, which is two orders of magnitude less sensitive than the parent compound endpoint value of 0.066 mg ai/L for the same species.

A single chronic toxicity study with acetamiprid degradates was carried out with the IM 1-5 degradation product in *D. magna* (MRID 44651871). Significant reduction in mean number of offspring (30%) was observed at 51 mg ai/L, the LOAEC, resulting in a NOAEC of 26 mg ai/L based on impaired reproduction.

Overall, the data suggest that degradation products of acetamiprid have low toxicity to aquatic invertebrates, although similar toxicity of IM 1-4 to *D. magna* relative to the parent compound indicates that they may be equally toxic to some aquatic animal taxa. Given this uncertainty, a total toxic residues (TTR) approach is recommended for risk assessment for aquatic animals, where combined exposure values for parent and IM 1-4 degradate are compared to study endpoints for the purpose of estimating risk. An additional rationale for considering IM 1-4 in a TTR approach is that many degradates ultimately transform into IM 1-4 and IM 1-4 was observed at high levels in both field and lab studies. Identification and discussion of acetamiprid degradates that will be considered as residues of concern for risk assessment is provided in the portion of the document dealing with stressors or concern (Section 9).

Table 8-4. Aquatic Toxicity Endpoints for Degradates of Acetamiprid

| Species (Degradate) | Measured Effect | Duration | Endpoint | Toxicity Value mg ai/L | Degradate % ai | MRID (Study Classification) |
|--|----------------------------|----------|------------------|---|-----------------|-----------------------------|
| Freshwater Fish | | | | | | |
| <i>Oncorhynchus mykiss</i> (Rainbow Trout) | Mortality | 96 hours | LC ₅₀ | >98.1* (Slightly to practically non-toxic) | IM 1-4 96.7% | 44651865 (Acceptable) |
| Freshwater Invertebrates | | | | | | |
| <i>Daphnia magna</i> (Water flea) | Immobility | 48 hours | EC ₅₀ | >95.1* (Practically non-toxic) | IC-0 99.7% | 44988409 (Acceptable) |
| | Immobility | 48 hours | EC ₅₀ | >99.8* (Practically non-toxic) | IM 1-2 99.6% | 44651867 (Acceptable) |
| | Immobility | 48 hours | EC ₅₀ | 43.9 (Slightly toxic) | IM 1-4 98.7% | 44651868 (Acceptable) |
| <i>Chironomus riparius</i> (Non-biting Midge) | Mortality | 48 hours | LC ₅₀ | 68 (Slightly toxic) | IM 1-5 98.9% | 46255610 (Acceptable) |
| <i>Daphnia magna</i> (Water flea) | Number of young per female | 21 days | NOAEC LOAEC | 26 51 | IM 1-5 98.9% | 46255609 (Supplemental) |
| Estuarine/Marine Invertebrates | | | | | | |
| <i>Americamysis bahia</i> (Mysid shrimp) | Mortality | 96 hours | LC ₅₀ | 19 (Slightly toxic) | IM 1-4 99.6% | 44651870 (Acceptable) |

* Non-definitive study endpoint; cannot be used for risk estimation during risk assessment.

8.2. Effects to Terrestrial Organisms

The most sensitive toxicity endpoint values associated with acetamiprid exposure to terrestrial organisms are shown in **Tables 8-5** and **8-6**. These endpoints will be used to calculate RQs for acetamiprid. The ECOTOX database was searched on April 20, 2012 for terrestrial organism toxicity data, and relevant studies are preliminarily discussed in the sections below.

8.2.A. Acetamiprid (Parent) Toxicity

(a) 4.2.1.1. Birds

Acute oral toxicity studies have been submitted for two avian species: the zebra finch (*Taeniopygia guttata*; MRID 48407701) and the mallard duck (*Anas platyrhynchos*; MRID 44651859). The former study was submitted in 2011 in order to represent toxicity to passerine birds. Acetamiprid is very highly toxic to zebra finches (14-day LD₅₀ = 5.68 mg ai/kg-bw) and moderately toxic to mallards (LD₅₀ of 84.4 mg ai/kg-bw) on an acute oral exposure basis. Zebra finches are the most sensitive species for acute oral toxicity and their endpoint will be used for risk assessment. In both studies, at least one sublethal effect (*e.g.*, ruffled appearance, lethargy, loss of coordination) was observed at all doses.

Subacute dietary toxicity studies were performed on both the mallard duck (MRID 44651861) and the northern bobwhite quail (*Colinus virginianus*; MRID 44651860). The mallard and bobwhite quail studies tested three and two concentrations, respectively. The 5-day dietary LC₅₀ reported in both of these studies was >5000 mg ai/kg-diet since less than 50% mortality was observed at all concentrations tested. Both studies reported mortalities and sublethal effects at one or more test levels. The lowest concentration where no effects were observed was 200 mg ai/kg-diet in the mallard study based on reduced survival, behavioral effects, and decreased food consumption and 1000 mg ai/kg-bw in the quail study based on reduced survival and decreased food consumption. According to OPPTS 850.2200 guidance, a minimum of five test substance concentrations should be used during definitive avian dietary toxicity tests. Moreover, when mortalities are observed at one or more concentration levels, as is the case in both of these studies, a full definitive study (*i.e.*, with five test concentrations) is recommended according to EFED's non-definitive endpoint guidance policy. Since a definitive endpoint was not established in either of these studies, they will not be used to calculate RQs but may be used to characterize effects to birds based on sub-acute dietary exposure. It should also be noted that an avian dietary toxicity study (MRID48844901) of acetamiprid in the zebra finch has recently been submitted and is currently under review.

Chronic toxicity to birds was initially evaluated in the form of two reproduction studies using mallards (MRID 44988408) and northern bobwhite quail (MRID 44988407). However, there were uncertainties regarding major endpoints in both studies resulting in submission of two new studies in the same two species (MRIDs 46369201, 46555601). In the more recent mallard study, reduced male body weight was the most sensitive endpoint and was observed at all treatment levels (treatment range: 60.2 to 461 mg ai/kg-diet). Number of eggs laid, eggs set, viable embryos, and hatchling body weights were all affected at the 461 mg ai/kg-diet level. In

the more recent bobwhite quail study, the most sensitive endpoint was reduced hatchling body weight, which was observed at all test concentrations except the lowest, resulting in NOAEC and LOAEC values of 89.7 and 184 mg ai/kg-diet, respectively. Number of eggs laid, eggs set, viable embryos, and hatchling body weights were all reduced relative to controls at the 771 mg ai/kg-diet level. Since the mallard duck showed higher sensitivity than the bobwhite quail but yielded a non-definitive endpoint, chronic risk will be assumed for birds (as well as reptiles and terrestrial-phase amphibians) during risk assessment unless an additional study is submitted.

(b) Mammals

Studies evaluating the toxicity of acetamiprid to mammals were reviewed by the OPP Health Effects Division (HED); based on those reviews, acetamiprid is classified as highly toxic to mammals on an acute oral exposure basis. During initial testing in male and female rats (*Rattus norvegicus*) at acetamiprid doses ranging from 100 to 510 mg/kg-bw, more than half of the females died at all test levels except the lowest (*i.e.*, 100 mg/kg-bw) (MRID 44651833). Therefore, additional testing was carried out, with female rats only, at doses ranging from 80 to 160 mg/kg-bw. Based on the additional testing, the 14-day LD₅₀ for female rats was 146 mg ai/kg-bw. Clinical signs of toxicity included crouching, tremors, low sensitivity, lateral position, prone position, salivation, and ataxia. All surviving animals returned to normal appearance and behavior by day 2 of the study.

Consistent results were reported in rats for a two-year chronic feeding study (MRIDs 44988429 and 45245304), a two-generation reproduction study (MRID 44988430), and a 13-week subchronic study (MRID 44651843) with acetamiprid. Reduction in growth, as measured by body weight, weight gain, and food consumption, was observed at test concentrations of 400-800 mg ai/kg-diet and greater; whereas test concentrations of 160-280 mg ai/kg-diet caused no significant adverse effects. In addition to growth endpoints, reproductive effects (*e.g.*, pup weight, litter size, viability) were also observed at 280 mg ai/kg-diet in the two-generation reproduction study (MRID 44988430). The NOAEC (160 mg/kg diet) that will be used for risk assessment will be based on the growth endpoints from the 2-year chronic feeding study.

(c) Terrestrial Invertebrates

An acute contact toxicity test with technical acetamiprid was conducted on young adult European honeybees (MRID 44651874). In this study, percent mortality was 40, 66.7, 46.7, 63.3, and 60% for the 6.25, 12.5, 25, 50, and 100 µg ai/bee test groups, respectively. The LD₅₀ for the contact study was reported as 8.1 µg/bee. However, there is uncertainty in this LD₅₀ value since no clear dose-response relationship was apparent. Since percent mortality was 66.7% at 12.5 µg ai/bee, the median mortality dose is considered to be below this value (*i.e.*, <12.5) suggesting that acetamiprid should be considered moderately toxic to honeybees on an acute contact exposure basis (Atkins *et al.*, 1976). In the ECOTOX database, Iwasa *et al.* (2004) report an acute contact 24-hr LD₅₀ of 7.07 µg ai/bee. Although this endpoint was based on nominal concentrations and the exposure period was half that of a typical guideline acute contact study (*i.e.*, 48 hrs), it does generally support the registrant-submitted study finding that acetamiprid is moderately toxic to honeybees on a contact exposure basis. A full open-literature

review of Iwasa *et al.* (2004) will be conducted during the upcoming risk assessment.

An acute oral study was also carried out in honeybees (MRID 44651874), as well as oral and contact studies in bumble bees (*Bombus terrestris*; MRID 45932503), but endpoint values were greater than those from the guideline honeybee acute contact toxicity study.

EPA currently relies on a tiered approach for evaluating the potential effects of pesticides on honeybees. If an acute contact toxicity test (Tier 1) results in a 48-hr LC₅₀ value less than 11 µg ai/bee, then honeybee toxicity of residues on foliage studies (Guideline 850.3030)¹⁸ can be required (Tier 2). However, if the 48-hr LC₅₀ is less than 11 µg ai/bee and there are data indicating potential effects to honeybee colonies, then field testing of pollinators (Tier 3) may be requested consistent with (Guideline 850.3040)¹⁹.

Since the reported 48-hr LD₅₀ of the honeybee acute contact toxicity study was <12.5 µg/bee, a toxicity of residues on foliage study was submitted (MRID 44651875) but was deemed unacceptable due to low recovery of acetamiprid on treated foliage. A second residues on foliage toxicity study was submitted, but has not yet been reviewed by EFED (MRID 45346901). Two semi-field studies conducted to evaluate the possible effect of acetamiprid on honeybee behavior were also submitted (MRIDs 45932504; 45932505), and were classified as supplemental²⁰. Both studies used tents to expose honeybees via contact with forage and/or overspray, and applications rates were equivalent to 0.15 and 0.09 lbs ai/A, which is in line with single application rates for many registered and proposed crop uses. Mortality, flight frequency, and foraging behavior were evaluated relative to a control and a known toxic standard. No significant effects on any endpoints were observed in either study from acetamiprid treatments.

Several open literature studies of acetamiprid effects on honeybees are available for acetamiprid. These studies will be thoroughly reviewed as part of the upcoming Registration Review risk assessment.

Table 8-5. Most Sensitive Terrestrial Animal Toxicity Endpoints for Acetamiprid

| Species | Measured effect | Endpoint | Test Duration | Toxicity Value (Acute Toxicity Category) | Test Substance % ai | MRID (Study Classification) |
|--|-----------------|------------------|---------------|--|---------------------|-----------------------------|
| Birds | | | | | | |
| <i>Taeniopygia guttata</i> (Zebra finch) | Mortality | LD ₅₀ | 14 days | 5.68 mg ai/kg-bw (Very highly toxic) | 99.9% | 48407701 (Acceptable) |

¹⁸ USEPA. 1996. Ecological Effects Test Guidelines. OPPTS 850.3030. Honeybee Toxicity of Residues on Foliage. EPA 712-C-96-148. April 1996.
http://www.epa.gov/ocspp/pubs/frs/publications/OPPTS_Harmonized/850_Ecological_Effects_Test_Guidelines/Drafts/850-3030.pdf

¹⁹ USEPA. 1996. Ecological Effects Test Guidelines. OPPTS 850.3040. Field Testing for Pollinators. EPA 712-C-96-150. April 1996.
http://www.epa.gov/ocspp/pubs/frs/publications/OPPTS_Harmonized/850_Ecological_Effects_Test_Guidelines/Drafts/850-3040.pdf

²⁰ Note: non-guideline studies cannot be rated “acceptable” since there are no guideline standards

| Species | Measured effect | Endpoint | Test Duration | Toxicity Value (Acute Toxicity Category) | Test Substance % ai | MRID (Study Classification) |
|--|---|------------------|---------------|--|----------------------|---|
| Bobwhite quail (<i>Colinus virginianus</i>) | Mortality | LC ₅₀ | 5 days | >5,000 mg/kg-diet* (Practically non-toxic) | >99% | 44651860 (Supplemental) |
| <i>Anas platyrhynchos</i> (mallard duck) | Growth (body weight; weight gain; food consumption) | NOAEC LOAEC | 22 weeks | <60.2 mg ai/kg-diet* 60.2 mg ai/kg-diet | 100% | 46369201 (Supplemental) |
| Mammals | | | | | | |
| <i>Rattus norvegicus</i> (laboratory rat) | Mortality | LD ₅₀ | 14 days | 146 mg/kg-bw; females [†] (Highly toxic) | 99.5% | 44651833 (Acceptable: Reviewed by HED) |
| | Growth (female body weight; female weight gain) | NOAEC LOAEC | 24 months | 160 mg/kg-diet (7.1 mg/kg-bw/day) 400 mg/kg-diet | Not stated in DER | 44988429 |
| Terrestrial Arthropods | | | | | | |
| <i>Apis mellifera</i> (Honeybee) | Mortality | LD ₅₀ | 72 hours | Acute contact <12.5 µg ai/bee Acute oral >10.21 µg ai/bee | 99% | 44651874 (Acceptable) |

* Non-definitive study endpoint; cannot be used for risk estimation.

(d) Terrestrial Plants

The most sensitive terrestrial plant toxicity data are presented in **Table 8-6**. Seedling emergence and vegetative vigor studies (MRID 44988413) were conducted on ten plant species with a test substance that was listed as 71.1% acetamiprid as wettable powder. Seedling emergence results were classified as supplemental because only shoot length, and not plant weight, was measured as an endpoint for growth. Based on shoot length, the most sensitive monocotyledonous (monocot) species was onion (*Allium cepa*; EC₂₅=0.23 lbs ai/A; NOAEC=0.077 lbs ai/A), and the most sensitive dicotyledonous (dicot) species was cucumber (*Cucumis sativus*; EC₂₅=0.16 lbs ai/A; NOAEC=0.077 lbs ai/A). The vegetative vigor study was classified as core (*i.e.*, acceptable) for all plants except for lettuce (*Lactuca sativa*), which was classified as supplemental because adverse (phytotoxic) effects were observed in control plants. The most sensitive monocot and dicot species were ryegrass (*Lolium perenne*; EC₂₅=0.46 lbs ai/A; NOAEC=0.31 lbs ai/A) and lettuce (EC₂₅=0.0087 lbs ai/A; NOAEC=0.0046 lbs ai/A), respectively. Since lettuce was particularly sensitive to acetamiprid but the study was classified as supplemental, an additional vegetative vigor study was carried out on lettuce alone (MRID 45921401). The results of this study support the previous finding that lettuce is relatively sensitive (EC₂₅=0.0056 lbs ai/A; NOAEC=0.0025 lbs ai/A) compared to other plant species tested. Since lettuce serves as a surrogate for broadleaf dicots, potential toxicity to this larger group of plants is possible. Two nonguideline studies were also carried out to more closely examine the effects of acetamiprid on lettuce. Both studies (MRIDs 46229601 and 46229602) reported that the variety of lettuce (*i.e.*, buttercrunch) used in the first two studies, accounted for

the greater sensitivity of lettuce relative to other species tested, and that other varieties of lettuce exhibited reduced sensitivities.

Table 8-6. Most Sensitive Terrestrial Plant Toxicity Endpoints for Acetamiprid.

| Species (Plant Group) | Test Substance | Study Type | EC ₂₅ (lbs ai/A) | NOAEC (lbs ai/A) | Endpoints Affected | MRID | Study Classification |
|------------------------------|--|--------------------|-----------------------------|------------------|--------------------|----------|----------------------|
| Onion (monocot) | Wettable powder formulation (71.1% ai) | Seedling emergence | 0.23 | 0.077 | Shoot length | 44988413 | Supplemental |
| Cucumber (dicot) | | | 0.16 | 0.077 | | | |
| Perennial ryegrass (monocot) | | Vegetative vigor | 0.46 | 0.31 | Plant weight | | Acceptable |
| Lettuce (dicot) | Wettable powder formulation (70.04 % ai) | | 0.0056 | 0.0025 | Shoot length | 45921401 | Supplemental |

8.2.B. Degradate Toxicity to Terrestrial Organisms

The only available acute or subacute avian study on an acetamiprid degradate is a subacute dietary toxicity study of the compound IM 1-4 with the mallard duck (MRID 44651862) (**Table 8-7**). The 5-day dietary LC₅₀ was >5000 mg ai/kg-diet, indicating that similar to the parent compound, IM 1-4 is practically non-toxic to mallards on a subacute dietary exposure basis. No mortalities were observed at any concentration in this study.

Acute oral toxicity tests with mammals were conducted on several metabolites and degradation products of acetamiprid (MRIDs 44988420, 44988421, 44988422, 44651834, 44651835). Results of these tests show that these compounds are considerably less toxic than the parent compound, and are classified as slightly toxic or practically nontoxic to mammals on an acute oral exposure basis.

Table 8-7. Available Terrestrial Animal Toxicity Endpoints for Degradates.

| Species | Measured effect | Endpoint | Toxicity Value (Acute Toxicity Category) | Test Substance % ai | MRID (Study Classification) |
|--|-----------------|------------------------|--|---------------------|-----------------------------|
| Birds | | | | | |
| <i>Anas platyrhynchos</i> (Mallard duck) | Mortality | 5-day LC ₅₀ | >5000 mg ai/kg-diet* (Practically non-toxic) | IM 1-4 | 44651862 (Acceptable) |
| Mammals | | | | | |
| Laboratory Rat | Mortality | LD ₅₀ | 1792 mg ai/kg-bw (Practically nontoxic) | IM-0 | 44988421 (Acceptable) |

| Species | Measured effect | Endpoint | Toxicity Value (Acute Toxicity Category) | Test Substance % ai | MRID (Study Classification) |
|---------|-----------------|------------------|--|---------------------------|-----------------------------------|
| | Mortality | LD ₅₀ | >5000 mg ai/kg-bw (Practically nontoxic) | IC-0 | 44988420 (Acceptable) |
| | Mortality | LD ₅₀ | 2176 mg ai/kg-bw (Practically nontoxic) | IM 2-2 99.9% | 44988422 (Acceptable) |
| | Mortality | LD ₅₀ | >5000 mg ai/kg-bw (Practically nontoxic) | IM 1-2 99.6% | 44651835 (Acceptable) |
| | Mortality | LD ₅₀ | 1088 mg ai/kg-bw (Slightly toxic) | IM 1-4 99.6% | 44651834 (Acceptable) |

* Non-definitive study endpoint; cannot be used for risk estimation.

† Endpoint value will be used for risk estimation

8.3. Incident Database Review

Since the time of the last risk assessment of acetamiprid in 2011, four incidents have been entered into U.S. EPA's Ecological Incident Information System (EIIS), which was last checked on August 28, 2012. One aquatic incident (I022234-001) took place in 2010 that involved a fire in a chemical warehouse containing Assail 70 WP insecticide (TGAI: acetamiprid) as well as an unreported list of other pesticides and fertilizers; water used to extinguish the fire resulted in runoff into a river that was ultimately linked to a fish kill of 700 to 1000 fish of unknown species. Since it is not possible to link any one chemical to this incident, the role of acetamiprid has been designated as "possible." Three incidents have been reported for acetamiprid related to honeybees. The first incident (I023702-003) spanned the years 2004-2006 and attributed hive population losses of 75-80% to Assail (acetamiprid) or Admire (imidacloprid). However, this information was published in the form of a newsletter and insufficient information was provided to determine the likelihood that acetamiprid was responsible. Another incident (I024270-001), which took place in May, 2012, reported dead bees in 48 colonies while pollination services were being provided to an orchard containing apple, apricot, and plum trees. Apparently, Assail was not applied until bees were removed from the area. It is unknown which other pesticides were applied during the bee kill incident. Based on this information, the role of acetamiprid in this incident is considered "unlikely." The final honeybee incident (I023979-002) took place on August 25, 2011 and was submitted in the form of an online news article. The incident occurred when a cotton field near the area where bees were being kept was sprayed with Assail 70WP at 8:30 am. All of the honeybees were reported to have died. This incident occurred 10 days after a similar bee kill incident attributed to Lorsban (chlorpyrifos); a 60-80 percent loss of the beekeeper's honeybees were reported to have died across the two incidents. Given that a spraying of Assail 70 WP was specifically associated with the bee kill, this incident is classified as "highly probable."

A total of 60 aggregated incidents have been reported in the Office of Pesticide Programs

Incident Data System (IDS) as of September 5, 2012. Forty-one (68%) of these incidents involved damage to plants, two (3%) incidents were reported for wildlife, and 18 (30%) were reported for domestic animals. Incident reports for non-target organisms typically provide information only on mortality events and plant damage. Sublethal effects in organisms such as abnormal behavior, reduced growth, or impaired reproduction are rarely reported, except for phytotoxic effects in terrestrial plants. EPA's changes in the registrant reporting requirements for incidents in 1998 may have further reduced the likelihood of incident reports. Registrants are now only required to submit detailed information on "major" fish, wildlife, and plant incidents. Minor fish, wildlife, and plant incidents, as well as all other non-target incidents, are generally reported in aggregate and are not included in EIIS. During the risk assessment associated with Registration Review of acetamiprid, these databases will be checked again and any additional incidents will be evaluated to determine if they represent current use patterns of acetamiprid.

The Avian Incident Monitoring System (AIMS; American Bird Conservancy 2009) was also queried on August 28, 2012, and did not list any bird incidents associated with acetamiprid.

9. Identification of Stressors of Concern

All major degradates of acetamiprid identified in fate studies have a similar pyridylmethanamine backbone as the parent and cannot be eliminated from scrutiny based on structural properties alone. Additionally, IM 1-2, IM-1-3, IM 1-4, IM 1-5, and IC-0 are all considered major degradates as they were observed with greater than 10% applied radioactivity associated with the degrade in some studies. Degradates IM-1-3, IM 1-4, and IM 1-5 were also relatively stable with peaks observed at the final sampling interval or high levels observed in studies over many days. While IM 1-3 is relatively stable, it was only a major degrade in the hydrolysis study (pH 9 at 35°C and 45°C and biotic metabolism is expected to be its predominant degradation pathway). Fate data suggest that exposure to these degradates (especially IM 1-4) could be significant compared to exposure to the parent.

Empirical toxicity data were used to determine whether degradates should be considered a residue of concern. Based on empirical toxicity data (**Table 9-1**), degradates IM 1-2, IM 1-5, IC-0, and IM-0 only have one or two established endpoints that can be compared with parent data from the same species. In these cases, these degradates appear to be less toxic than the parent. It should be noted that of the four degradates listed above, only IM 1-5 has data for any taxon that is considered to be highly sensitive to the parent (*i.e.*, chironomids, mysid shrimp). In this case, IM 1-5 is several orders of magnitude less sensitive to the non-biting midge than the parent compound. None of the above listed degradates have available data for mysid shrimp, which is the most sensitive estuarine/marine organism to acetamiprid. There is somewhat more data for IM 1-4 compared to the other degradates. IM 1-4 is similarly toxic to daphnids as the parent, but is considerably less toxic to mysid shrimp. In fish, it is not possible to make an adequate comparison since both acetamiprid and IM 1-4 endpoints are non-definitive. In insects, acute toxicity data indicate that the presence of an electron-withdrawing moiety (either a nitro or cyano group) is important for insecticidal activity, and the nitro group has been shown to result in higher toxicity to honey bees (Iwasa *et al.*, 2004). None of the degradates have the cyano or

nitro group. The assumption will be made in the assessment that IM 1-4 is a residue of concern for all aquatic animals as very limited data are available to evaluate sensitivity across species for this degradate; the impact of including IM-1-4 and unextracted residues on quantitation of risk values will be explored further during the risk assessment.

Table 9-1. Comparison of Available Empirical Toxicity Data for Acetamiprid and Degradates

| Compound | Empirical (Measured) Toxicity Endpoints | | | | | | |
|-------------|---|-----------------------------------|--|--|--------------------------|--|---------------------------------|
| | Rainbow Trout 96-hr LC ₅₀ | Daphnid 48-hr LC ₅₀ | Mysid Shrimp 96-hr EC ₅₀ | Non-biting Midge 96-hr LC ₅₀ | Daphnid Chronic NOAEC | Mallard Subacute Dietary LC ₅₀ | Rat Acute Oral LD ₅₀ |
| Units* | mg/L | mg/L | mg/L | mg/L | mg/L | mg/kg-diet | mg/kg-bw |
| Acetamiprid | >100 | 50 | 0.066 | 0.021 | 5.0 | >5000 | 146 |
| IM-1-2 | -- | >99.8 | -- | -- | -- | -- | 2176 |
| IM-1-4 | >98.1 | 43.9 | 19 | -- | -- | >5000 | 1088 |
| IM-1-5 | -- | -- | -- | 68 | 25 | -- | -- |
| IC-0 | -- | >95.1 | -- | -- | -- | -- | >5000 |
| IM-0 | -- | -- | -- | -- | -- | -- | 1792 |

* All units are expressed in terms of the parent or degradate (e.g., mg acetamiprid/L water or mg degradate/L water)

In an attempt to supplement available empirical toxicity data for acetamiprid transformation products, estimated toxicity data for degradates were generated using quantitative structure-activity relationships (QSAR) derived in the program ECOSAR²¹ (version 1.00). ECOSAR is only used to prioritize the need for additional data on degradates, not to derive endpoint values for use in estimating risk. ECOSAR estimates were compared to measured toxicity information for parent and degradates (**Table 9-2**; an example ECOSAR output is provided in **Appendix C**). QSAR estimates specific to the parent compound class (*i.e.*, halopyridines) were not accurate when compared to measured data. Moreover, ECOSAR estimates for degradates were also not accurate compared to the empirical degradate dataset. Therefore, ECOSAR estimates appear to be of limited use in predicting degradate toxicity for these degradates. ECOSAR did, however, predict increased chronic toxicity of IM-1-4 in daphnids (0.025 mg IM 1-4/L) compared to that of the parent (0.097 mg acetamiprid /L) (**Table 9-2**) when using the aliphatic amine chemical class as the basis for analysis.

Based on the available information, none of the identified degradates appear to be more toxic than the parent. There is some evidence that acetamiprid and IM 1-4 may be similarly toxic to daphnids; conversely, mysid shrimp are approximately two orders of magnitude more sensitive to acetamiprid than to IM-1-4. Based on toxicity results for these two species, the extent of IM 1-4 toxicity to aquatic animals besides mysid shrimp is uncertain. Therefore, unless additional data on toxicity of IM 1-4 to other aquatic animals become available prior to risk assessment, total residues of parent plus IM 1-4 will be compared to the most sensitive acute and chronic aquatic animal endpoints for the parent or IM 1-4, whichever is more sensitive. In addition, unextracted residues will also be included in the TTR exposure calculations since it is uncertain how much of these unidentified residues are parent or IM 1-4. No specific additional studies to address

²¹ <http://www.epa.gov/oppt/newchems/tools/21ecosar.htm>

degradate toxicity are recommended at this time.

Table 9-2. ECOSAR Quantitative Structure-Activity Relationship (QSAR) Toxicity Predictions for Acetamiprid and Degradates

| Compound (compounds class used by ECOSAR) | Estimated Toxicity Endpoint (mg/L) | | | | |
|---|------------------------------------|--------------------------------------|---------------------------------------|-----------------------|--------------------------|
| | 96-hr FW Fish LC ₅₀ | 48-hr Daphnid LC ₅₀ | 96-hr EC ₅₀ Green Algae | Fish Chronic Value | Daphnid Chronic Value |
| ECOSAR TOXICITY PREDICTIONS | | | | | |
| Acetamiprid (Parent) | | | | | |
| Empirical (Measured) | >100 | 50 | >1.3 | 19.2 | 5.0 |
| Halopyridines | 0.21 | 0.73 | -- | 0.30 | 0.97 |
| Neutral SAR | 59 | 36 | 19 | 5.5 | 3.7 |
| IM 1-2 | | | | | |
| Empirical (Measured) | -- | >99.8 | -- | -- | -- |
| Amides | 771 | 236 | 1.6 | 4.6 | -- |
| Halopyridines | 0.225 | 1.4 | -- | 8.9 | -- |
| Neutral SAR | 5774 | 2692 | 563 | 570 | 182 |
| IM 1-3 | | | | | |
| Amides | 284 | 101 | 1.0 | 1.7 | -- |
| Halopyridines | 0.19 | 1.0 | -- | 3.9 | -- |
| Neutral SAR | 2008 | 988 | 248 | 196 | 72 |
| IM 1-4 | | | | | |
| Empirical (Measured) | >98.1 | 43.9 | -- | -- | -- |
| Aliphatic Amines | 182 | 14 | 3.8 | 2.8 | 0.025 |
| Halopyridines | 0.15 | 0.80 | -- | 3.3 | -- |
| Neutral SAR | 1724 | 843 | 208 | 169 | 61 |
| IM 1-5 | | | | | |
| Empirical (Measured) | -- | -- | -- | -- | 25 |
| Halopyridines | 0.184 | 1.369 | -- | 27.067 | 0.752 |
| Neutral Organic | 28011 | 11695 | 1682 | 2821 | 673 |
| IC-0 | | | | | |
| Empirical (Measured) | -- | >95.1 | -- | -- | -- |
| Halopyridines-acid | 1.5 | 6.9 | -- | 12 | 1.1 |
| Neutral SAR | 447 | 238 | 78 | 43 | 20 |
| IM-0 | | | | | |
| Halopyridines | 0.13 | 0.75 | -- | -- | -- |
| Benzyl Alcohols | 360 | 194 | -- | -- | -- |
| Neutral SAR | 1934 | 934 | 221 | 190 | 67 |

Method of Estimating Exposure and Evaluating Risk for Degradates

To estimate exposure to compounds assumed to have a similar toxicity to the parent (e.g., IM 1-4 for aquatic organisms), a TTR approach will be used by summing the residues observed in fate studies and then estimating degradation rates based on the total summed residues. The TTR

degradation rates will then be used to estimate exposure in place of degradation rates for the parent alone. As stated previously, the residues used to estimate degradation rates to estimate exposure for aquatic organisms will be parent, IM-1-4, and unextracted residues. The modeled TTR amounts will then be compared to toxicity endpoints for the parent or IM-1-4, whichever is more sensitive for each taxon. For human health drinking water, residues of concern are assumed to be the parent and unextracted residues and these residues will be combined to calculate degradation rates to arrive at a final estimated drinking water concentration (EDWC).

For terrestrial organisms, only the parent is considered a residue of concern as previously identified for human health. Unextracted residues are still considered a residue of concern for terrestrial organisms since these residues could consist of the parent compound. However, the T-REX program, which is used to model exposure of terrestrial organisms to acetamiprid, does not use fate data for modeling, except in the case of foliar dissipation data (which is not available for acetamiprid). Therefore, even though a TTR approach (parent plus unextracted residues) is relevant for terrestrial vertebrates, it does not influence exposure estimates. For terrestrial invertebrates, a standard procedure is not available to estimate exposure at this time, and may be addressed further at the time of the risk assessment. For terrestrial plants, the program TERRPLANT, which estimates exposure through spray drift and runoff, is also not influenced by fate parameters. SCIGROW and PRZM/EXAMS may be used to estimate exposure to residues in irrigation water and parent and unextracted residues will be included in the degradation rates used to estimate exposure.

Table 9-3 summarizes the different approaches for assessing risk to degradates for each taxon.

Table 9-3. Summary of Residues of Concern and Methods of Estimating Exposure for Different Classes of Organisms

| Taxa | Residues of Concern ¹ | Toxicity Assumption/ Exposure Assumption | Method of Estimating Exposure |
|--------------------------------------|---|---|--|
| Aquatic Animals | Acetamiprid, IM 1-4, unextracted residues | Similar Toxicity TTR | PRZM/EXAMs |
| Aquatic Plants | | | |
| Terrestrial Vertebrates ² | Parent and Unextracted Residues | Similar Toxicity TTR | T-REX , unextracted residues will not influence results |
| Human Drinking Water | Parent and Unextracted Residues | Similar Toxicity TTR | PRZM/EXAMs, unextracted residues will influence results |
| Terrestrial Invertebrates | Parent and Unextracted Residues | Similar Toxicity TTR | Exposure not currently estimated |
| Terrestrial Plants | Parent and unextracted residues | Similar Toxicity TTR | TERRPLANT, unextracted residues will not influence results SCIGROW and PRZM/EXAMs for irrigation water, unextracted residues will influence results |

Abbreviation: TTR= Total toxic residue approach

¹ Unextracted residues are only relevant residues of concern for terrestrial organisms when exposure is estimated for drinking water or for residues in irrigation water.

² Residues included in the TTR approach for these taxa are based on HED analysis of residues of concern for

humans and analysis of available toxicity data on degradates for birds.

Mixtures

Evaluation of pesticide environmental mixtures is beyond the scope of this assessment because of the myriad factors that cannot be quantified based on the available data. Those factors include identification of other possible co-contaminants and their concentrations, differences in the pattern and duration of exposure among contaminants, and the differential effects of other physical/chemical characteristics of the receiving waters (*e.g.* organic matter present in sediment and suspended water). Evaluation of factors that could influence additivity/synergism is beyond the scope of this assessment and the capabilities of the available data to allow for an evaluation. However, it is acknowledged that not considering mixtures could over- or under-estimate risks depending on the type of interaction and factors discussed above. The assessment will, however, analyze the toxicity of formulated products (including formulations involving more than one active ingredient) and will determine whether formulated products are more toxic than the technical grade active ingredient data used for assessing both direct and indirect risks. There are four registered Section 3 products that contain more than one active ingredient. Three contain acetamiprid and bifenthrin and one contains acetamiprid (0.26%) and triticonazole (0.78%). Available data on rat oral LD₅₀s for these formulations do not indicate that the formulations are more toxic to mammals than the active ingredient alone. Therefore, it is assumed that formulation toxicity is similar to the parent toxicity for terrestrial organisms. For aquatic organisms, exposure to entire formulations may occur with spray drift into a water body or when a product is applied directly to water. Products applied to cranberries may be directly applied to water. The only other product that is applied in an agricultural setting that could result in spray drift is for the product containing acetamiprid (13%) and bifenthrin (10%) (EPA Reg. No. 8033-116) that is used on soybean. Additional data on the aquatic toxicity of the product used on soybeans and representative typical end-use products used on cranberries are needed.

10. Ecosystems Potentially At Risk

The ecosystems at risk are often extensive in scope, and as a result it may not be possible to identify specific ecosystems during the development of a baseline risk assessment. However, in general terms, terrestrial ecosystems potentially at risk could include the treated field and areas immediately adjacent to the treated field that may receive drift or runoff. Areas adjacent to the treated field could include cultivated fields, fencerows and hedgerows, meadows, fallow fields or grasslands, woodlands, riparian habitats and other uncultivated areas.

Aquatic ecosystems potentially at risk include water bodies adjacent to, or downstream from, the treated field and might include impounded bodies such as ponds, lakes and reservoirs, or flowing waterways such as streams or rivers. For uses in coastal areas, aquatic habitat also includes marine ecosystems, including estuaries.

11. Assessment Endpoints

Assessment endpoints are defined as "explicit expressions of the actual environmental value that

is to be protected." Selection of the assessment endpoints is based on valued entities (e.g., fish, birds), the ecosystems potentially at risk (e.g., water bodies, riparian vegetation, and upland habitats), the migration pathways of acetamiprid (e.g., runoff, drift, etc.), and the routes by which ecological receptors are exposed to acetamiprid (e.g., direct contact, etc.). Assessment endpoints for acetamiprid include direct adverse effects on the survival, reproduction, and growth of the receptors, as well as indirect effects, such as reduction of the prey base or modification of habitat. Each assessment endpoint requires one or more "measures of ecological effect," defined as changes in the attributes of an assessment endpoint or changes in a surrogate entity or attribute in response to exposure to a pesticide. Specific measures of ecological effect are generally evaluated based on acute and chronic toxicity information from registrant-submitted guideline tests that are performed on a limited number of organisms. Additional ecological effects data from the open literature will also be considered.

12. Conceptual Model

For a pesticide to pose an ecological risk, it must reach ecological receptors in biologically significant concentrations. An exposure pathway is the means by which a pesticide moves in the environment from a source to an ecological receptor. For an ecological pathway to be complete, it must have a source, a release mechanism, an environmental transport medium, a point of exposure for ecological receptors, and a feasible route of exposure.

The conceptual model for acetamiprid provides a written description and visual representation of the predicted relationships between acetamiprid and degradates, potential routes of exposure, and the predicted effects for the assessment endpoint. A conceptual model consists of two major components: risk hypothesis and a conceptual diagram (USEPA, 1998).

12.1. Risk Hypothesis

A risk hypothesis describes the predicted relationship among the stressor, exposure, and assessment endpoint response along with the rationale for their selection (USEPA, 2004). For assessment of acetamiprid, the risk is stressor-initiated, where the stressor is acetamiprid and a major degradate IM-1-4 which was identified in the previous risk assessment as having a similar toxicity to that of the parent (USEPA, 2009, D364328). The risk hypothesis for this risk assessment is provided below:

Given the uses of acetamiprid and its environmental fate properties, there is a likelihood of exposure to non-target terrestrial and/or aquatic organisms. When used in accordance with the label, acetamiprid results in potential adverse effects upon the survival, growth, and reproduction of non-target terrestrial and aquatic organisms. Based on previous risk assessments there are potential direct risks to birds, mammals, freshwater invertebrates, estuarine/marine invertebrates, and terrestrial dicotyledonous plants.

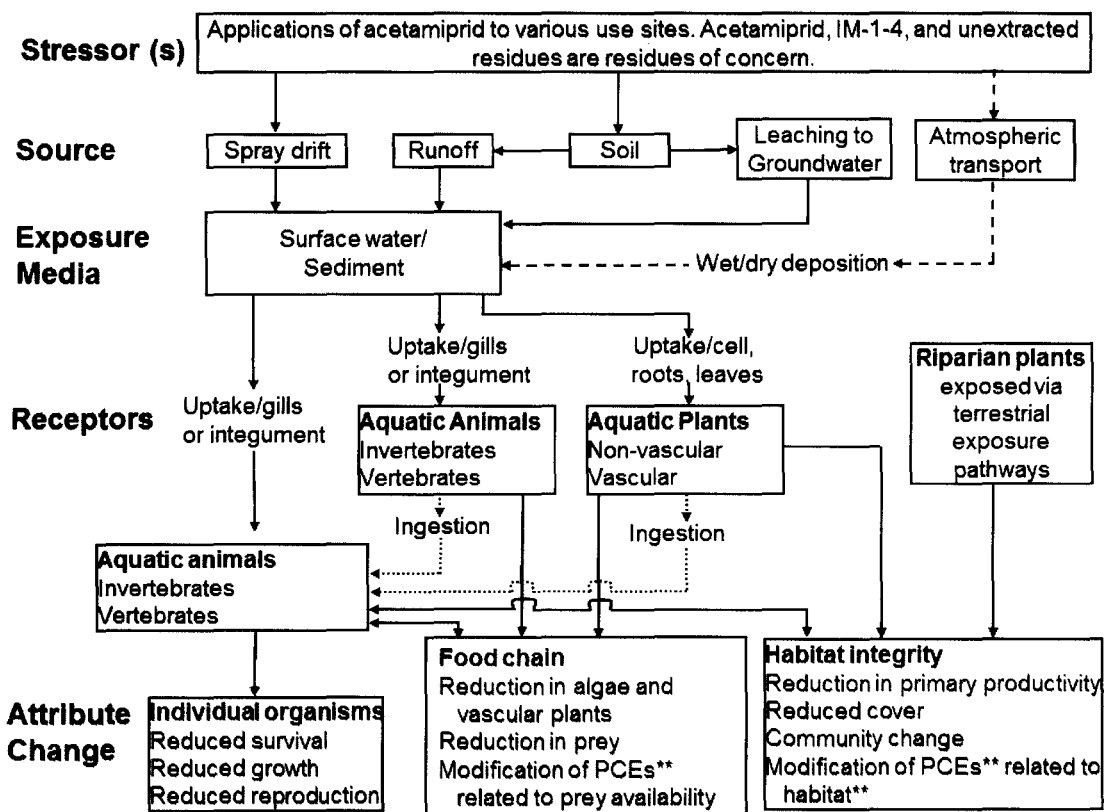
12.2. Conceptual Diagram

The conceptual model depicts the potential pathways for ecological risk associated with acetamiprid use on a variety of use sites. The conceptual model provides an overview of the expected exposure routes for terrestrial and aquatic organisms. In assessments, determinations are made on whether direct and indirect effects are likely to occur and on whether habitat modification may occur. The potential for habitat modification is determined based on primary constituent elements (PCEs) (as defined in 50 CFR 414.12(b)) for listed species. Although the conceptual models for direct/indirect effects and modification of designated critical habitat (PCE)s are shown on the same diagrams, the potential for direct/indirect effects and modification of PCEs will be evaluated separately in the assessment.

The potential exposure pathways and effects of acetamiprid on aquatic environments are depicted in **Figure 12-1** and for terrestrial environments in **Figure 12-2**. **Figure 12-3** depicts exposure from drinking water and inhalation to terrestrial vertebrates and invertebrates. Stressors of concern for aquatic animals and plants include parent acetamiprid, IM-1-4, and unextracted residues. Stressors of concern for terrestrial animals and terrestrial plants include acetamiprid alone. Unextracted residues are also included in the exposure assessment to terrestrial organisms when applicable (*e.g.*, when estimating exposure to residues in irrigation water for terrestrial plants). Solid arrows depict the most likely routes of exposure and effects; dashed lines depict potential routes of exposure that are not considered likely for acetamiprid. Applications to individual trees can result in absorption and translocation of acetamiprid from the site of application throughout the tree. Birds, mammals, and terrestrial invertebrates may be exposed through ingestion of leaves, seeds, pollen, or other edible portions of the tree. These exposure pathways are depicted in the conceptual model in **Figure 12-4**, along with the receptors of concern and the potential attribute changes in the receptors due to exposures of acetamiprid.

Acetamiprid will enter the environment via direct application to terrestrial environments. It may move off site via spray drift, runoff, and leaching. Acetamiprid is considered non-volatile from dry non-adsorbing surfaces, water, and soil. Additionally, the Screening Tool for Inhalation Risk (STIR) version 1.0 (November 23, 2010) indicates that exposure via inhalation is not likely to be a risk concern for birds and mammals (**Appendix E**). These results combined with the estimated atmospheric half-life of less than two days indicate that long-range transport in the vapor phase is not an exposure pathway of concern. Additionally, the K_{OA} , K_{OW} , and BCF suggest that acetamiprid is not likely to bioconcentrate or bioaccumulate in aquatic or terrestrial organisms. Organic-carbon normalized sorption coefficient (K_{OC}) values range from 157 to 300 L/kg-oc indicating that acetamiprid is classified as moderately mobile under the FAO mobility classification system. The Screening Imbibition Program (SIP) version 1.0, August 19, 2010 identifies that acetamiprid has the potential to be present in drinking water at high enough concentrations to result in a risk concern (**Appendix E**). This is a highly conservative evaluation as SIP assumes that concentrations in drinking water could be at the level of solubility. Acetamiprid may be applied as a flowable, as a gel, or in bait stations. Spray drift is only expected to result in significant exposure with broadcast applications (both aerial and ground boom spray) of liquids. Spray drift is assumed to be negligible for applications of liquids with a

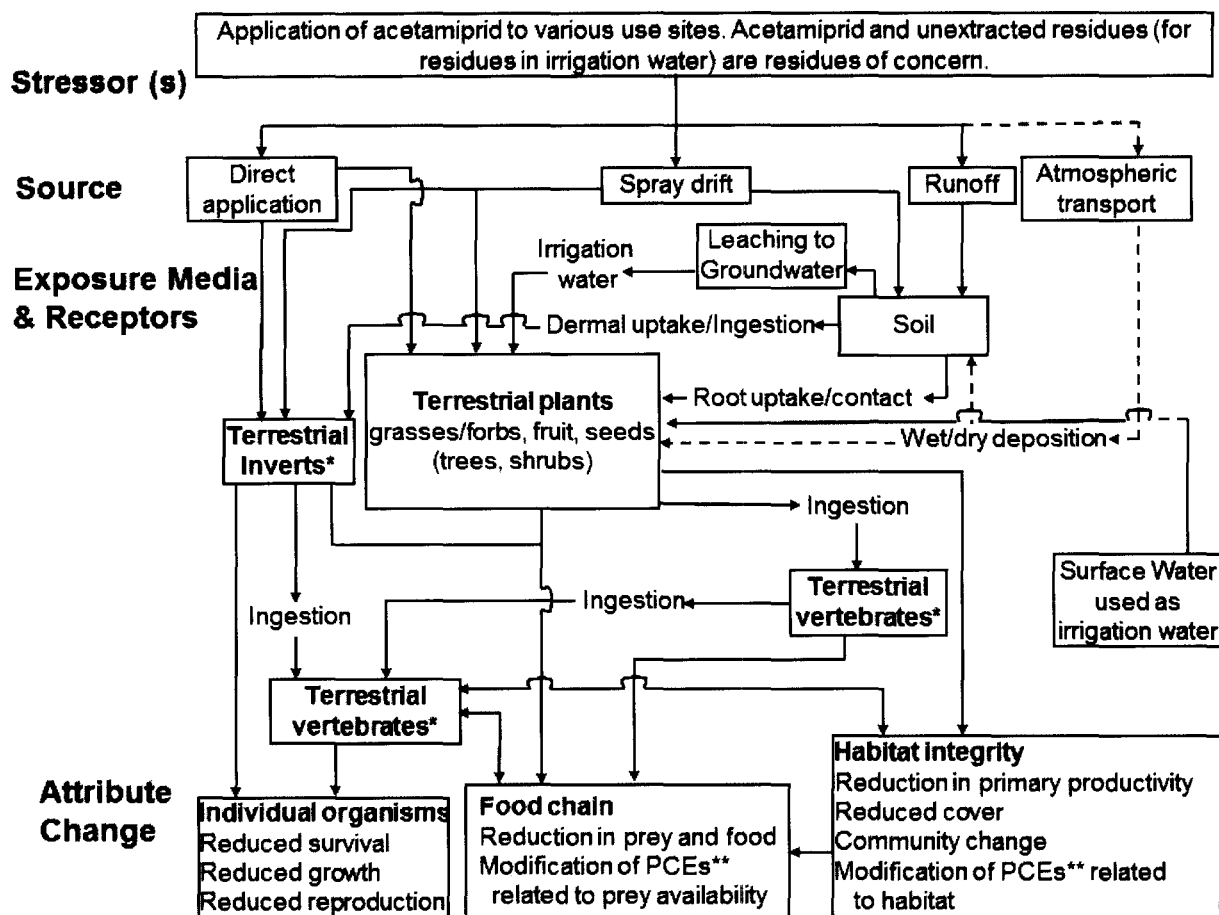
hand held sprayer. When acetamiprid is placed into a bait station, runoff into the aquatic environment will likely be negligible; however, consumption of bait by non-target insects and terrestrial vertebrates may still occur. Aquatic exposure to residues injected into trees will be assumed to be minimal/negligible based on a communication with the technical registrant that acetamiprid is only injected into high value trees in residential areas. Finally, when acetamiprid is applied underground as for some of the termiticide uses, leaching to ground water may occur while spray drift and runoff are not likely to occur.



*Spray drift is not expected to be a significant pathway of exposure for applications of granular materials, seed treatments, and for applications of liquids with a hand held sprayer.

**PCE stands for primary constituent elements and are used to determine whether habitat modification may occur.

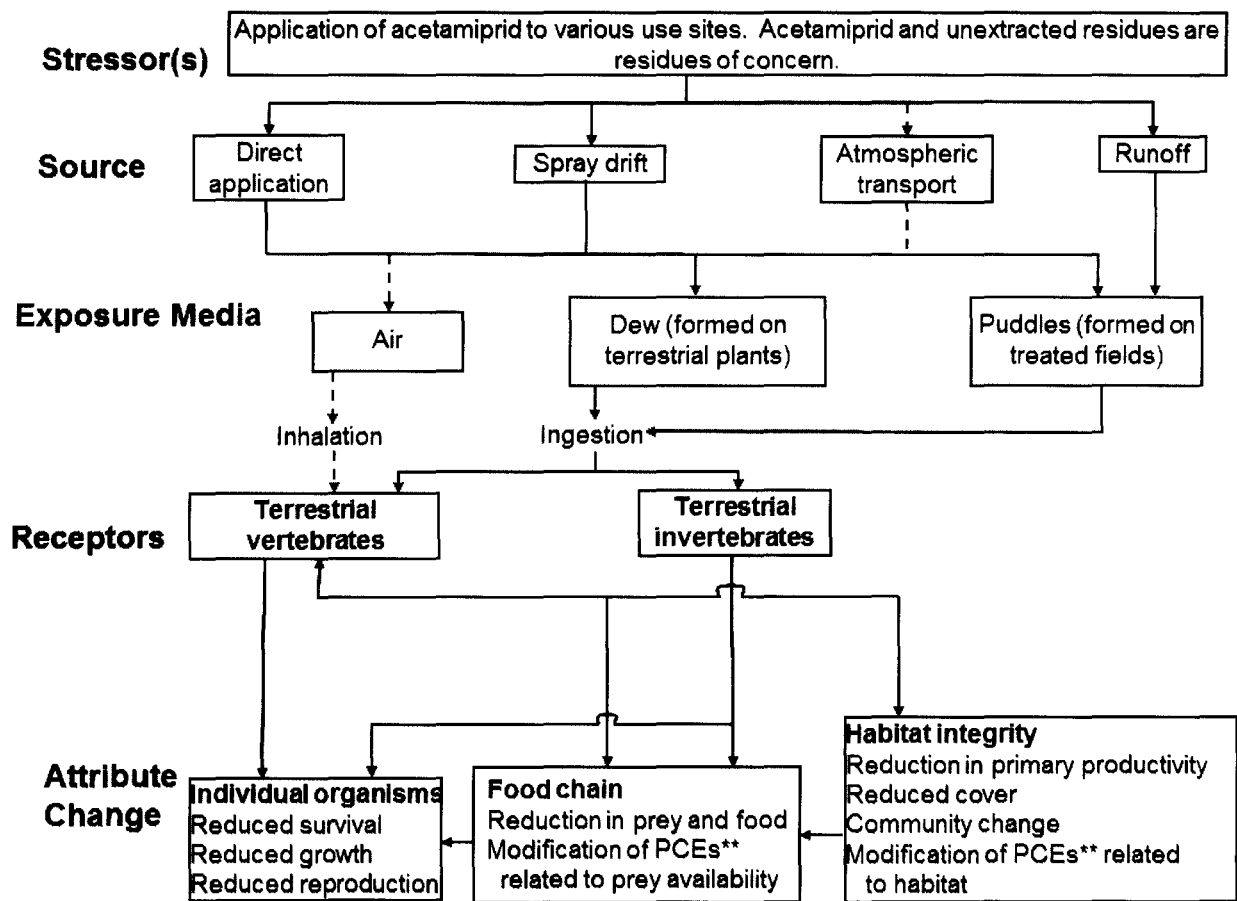
Figure 12-1. Conceptual model depicting stressors, exposure pathways, and potential effects to aquatic organisms and their habitat from the use of acetamiprid



*Spray drift is not expected to be a significant pathway of exposure for applications of granular materials, seed treatments, or applications of liquids with a handheld sprayer. See Figure 12-3 for drinking water and inhalation exposure pathways for terrestrial vertebrates and ingestion of residues in dew by terrestrial invertebrates.

**PCE stands for primary constituent elements and are used to determine whether habitat modification may occur.

Figure 12-2. Conceptual model depicting stressors, generic exposure pathways, and potential effects to terrestrial organisms (terrestrial plants, terrestrial invertebrates, and dietary routes of exposure for terrestrial vertebrates) and their habitat from the use of acetamiprid



*Spray drift is not expected to be a significant pathway of exposure for applications of granular materials, seed treatments, or applications of liquids with hand held sprayers.

**PCE stands for primary constituent elements and are used to determine whether habitat modification may occur.

Figure 12-3. Conceptual model depicting stressors, drinking water and inhalation exposure pathways, and potential effects to terrestrial animals from the use of acetamiprid

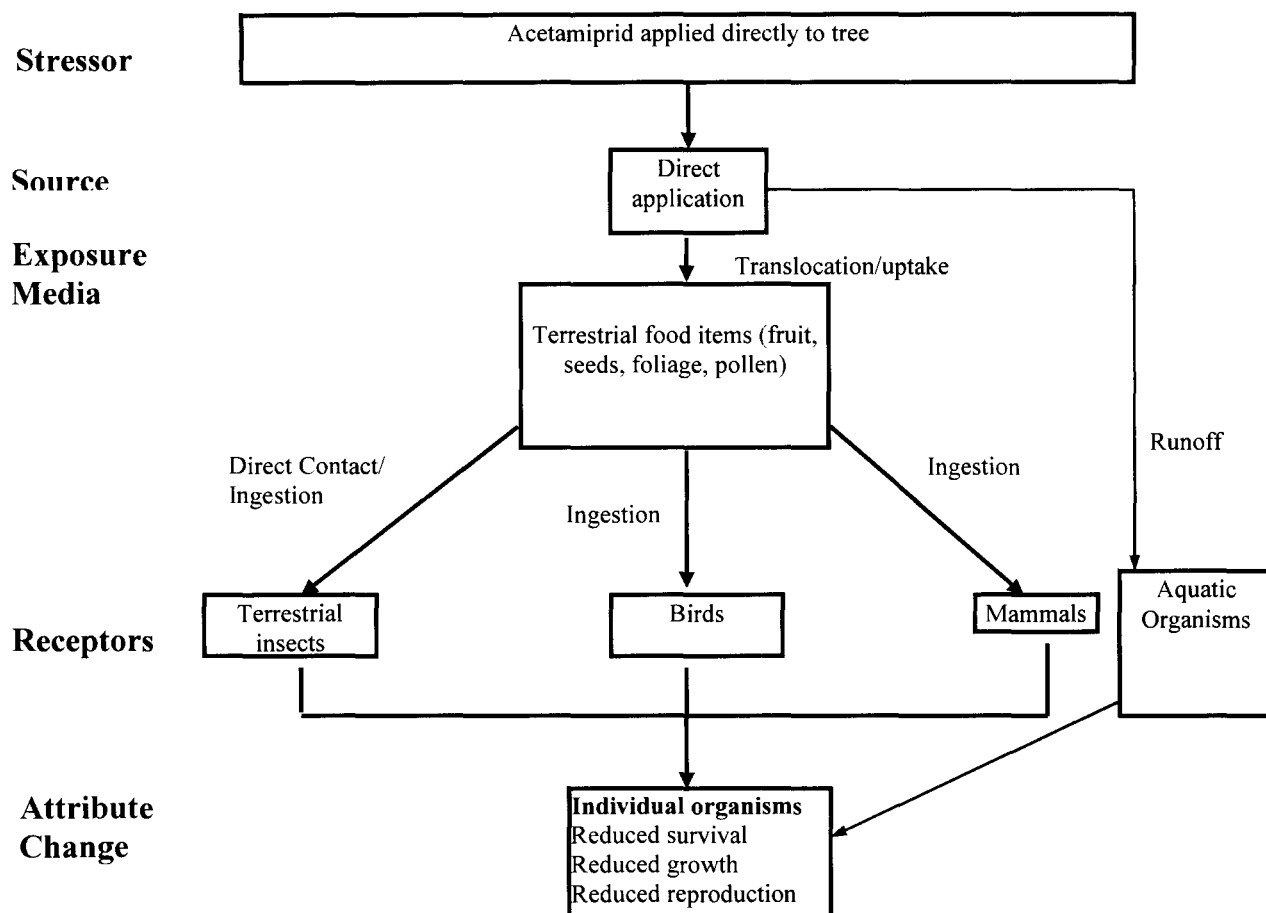


Figure 12-4. Conceptual model depicting stressors, exposure pathways, and potential effects to aquatic and terrestrial organisms from applications of acetamiprid to individual trees.

13. Analysis Plan

In order to address the risk hypothesis, the potential for adverse effects on the environment is estimated. The use, environmental fate, and ecological effects of acetamiprid are characterized and integrated to assess the risks. This is accomplished using a risk quotient (ratio of exposure concentration to effects concentration) approach. Although risk is often defined as the likelihood and magnitude of adverse ecological effects, the risk quotient-based approach does not provide a quantitative estimate of likelihood and/or magnitude of an adverse effect. However, as outlined in the Overview Document (USEPA, 2004b), the likelihood of adverse effects to individual organisms from particular uses of acetamiprid is estimated using the probit dose-response slope and either the level of concern (discussed below) or actual calculated risk quotient value.

This analysis plan will be revisited and may be revised depending upon the information

submitted by the public in response to the opening of the Registration Review docket for acetamiprid.

13.1. Measures of Exposure

In order to estimate risks of acetamiprid exposure in aquatic and terrestrial environments, all exposure modeling and resulting risk conclusions will be based on current label information on the maximum application rates and will be estimated for each use of acetamiprid. Measures of exposure are based on aquatic and terrestrial models that predict EECs of acetamiprid.

13.1.A. Exposure in the Aquatic Environment

Concentrations of acetamiprid and associated residues (IM-1-4 and unextracted residues) in surface waters (EECs) will be estimated using PRZM (Pesticide Root Zone Model version 3.12.2; May 12, 2005) and EXAMS (Exposure Analysis Modeling System version 2.98.04.06; April 25, 2005) (Burns, 2000; Carsel *et al.*, 1997). The PRZM model simulates pesticide movement from and transformation on an agricultural field following application. The EXAMS model simulates resulting concentrations in a receiving water body. The PRZM and EXAMS models and their user manuals may be downloaded from the EPA Water Models web-page (USEPA, 2011b). Percent Cropped Area (PCA) adjustment factors are used to account for the maximum fractional area within a watershed that may be planted with a modeled crop, and are used to modify human health drinking water concentrations predicted by PRZM and EXAMS (Echeverria *et al.*, 2012). Acetamiprid has uses in agricultural, commercial, and residential uses sites; therefore, a PCA of 1.0 will be used.

EFED is currently exploring methods to assess urban and residential uses on a national basis. At the present time, EFED considers the use of the impervious scenario (a Pesticide Root Zone Model (PRZM) modeling scenario) as the most suitable available modeling approach for impervious runoff. The PRZM impervious scenario may be used in the tier II coupled aquatic models PRZM/EXAMS along with a residential or other suitable scenario such as rights-of-way (ROW) to obtain EECs. The conceptual model for the residential scenario integrates simultaneous modeling of the individual use scenario with an impervious scenario. This approach assumes that no watershed is completely covered by either the ¼ acre lot (the basis for the residential scenario) or undeveloped land (the basis for the ROW scenario) for residential and ROW use patterns; therefore, differential amounts of runoff will occur within the watershed. The impervious scenario was developed to represent the paved areas within a watershed not including roads, parking lots, sidewalks, and buildings outside the ¼ acre lot (the ¼ acre lot scenario accounts for impervious surfaces such as buildings within the represented area). By modeling a separate scenario for impervious surfaces, it is also possible to estimate that amount of exposure that could occur when the pesticide is oversprayed onto this surface. Using two scenarios in tandem requires post-processing of the modeled output in order to derive a weighted EEC that represents the contribution of both the pervious (*i.e.*, residential and ROW scenarios) and the impervious surfaces. Exposure from both scenarios can also be weighted and aggregated. The daily time series from each model run from the times series file

(NAME_TS.out) generated from the PRZM graphical user interface (PE5.pl) residential and impervious surface scenarios are combined using EXCEL. The time series data are weighted based on percentage of impervious surface, the percentage of the pervious surface treated, and an adjusted time series is created. Rolling averages for the relevant durations of exposure (e.g., 21 day and 60 day averages) are calculated, and the relevant one-in-ten year return EEC is generated from these distributions.

Concentrations of acetamiprid and associated residues (IM-1-4 and unextracted residues) in ground water will be estimated using EFED's Tier I aquatic model SCIGROW (Screening Concentration In Ground Water, version 2.3; 8/8/2003). SCIGROW is a regression model used as a screening tool to estimate pesticide concentrations found in ground water used as drinking water. The output of SCIGROW represents concentrations that might be expected in shallow unconfined aquifers under sandy soils, and therefore represents ground water that is most potentially vulnerable to pesticide contamination. The SCIGROW model and user's manual may also be downloaded from the EPA Water Models web-page (USEPA, 2011b). Aerobic soil metabolism may be assumed to be negligible for uses that are applied at depths where microbial activity is minimal.

The exposure assessment for house perimeter treatment required a modification in the standard modeling approach to account for the lack of uniform pesticide application in a small watershed such as yard, housing development, etc. The recommended perimeter treatment requires a 10 feet treated area around the perimeter of the house and allows for treatment of 3 feet up the side of the building. A treated area factor was estimated using a housing density of four 2000 ft² houses per acre. Each house has a perimeter of 180 ft and treated area of 2,340 ft² (180 ft × 13 ft). The estimated treated area per acre is then 9,360 ft² which results in an estimated 21% of an acre (9,360ft²/43,560ft²/acre). The application rate may be assumed to be 21% of the actual for the perimeter treatment scenario.

In addition to modeling estimates, available monitoring data will be evaluated. Monitoring data will include those collected/reported by states as well as other federal departments/agencies (e.g., USGS National Water Quality Assessment; <http://water.usgs.gov/nawqa>).

A downstream dilution model (under development) may be used to identify areas downstream from a use area that may have EECs high enough to result in a risk concern. This analysis will be used to define the potential area of effects for endangered species.

13.1.B. Exposure to Terrestrial Animals via Residues on Food Items

Exposure estimates for terrestrial animals assumed to be in the target area or in an area exposed to spray drift are derived using the T-REX model (version 1.4.1, 10/09/2008) (USEPA, 2008a). This model incorporates the Kenaga nomograph, as modified by Fletcher *et al.* (1994), which is based on a large set of field residue data. The upper-limit values from the nomograph represent the upper bound of residue values from actual field measurements (Hoerger and Kenaga, 1972). The Fletcher *et al.* (1994) modifications to the Kenaga nomograph are based on measured field residues from 249 published research papers, including information on 118 species of plants, 121

pesticides, and 17 chemical classes (Fletcher *et al.*, 1994). Based on these data, T-REX assumes a 35-day foliar dissipation half-life in the absence of other data.

For applications of gels containing acetamiprid, acute exposure and risks to terrestrial wildlife are estimated with the conceptual approach and the LD_{50}/ft^2 method given in the model T-REX. Terrestrial EECs are calculated based on an estimation of loadings of pesticide per unit area (expressed in terms of $mg\ ai/ft^2$) for a single application (multiple applications are not accounted for in this analysis); the available mass of pesticide per square foot is then compared to the acute oral dose for toxicity (LD_{50} values adjusted for body weight and percent body weight consumed) to derive risk quotients for birds and/or mammals.

The T-REX model is used to estimate exposures and risks to avian and mammalian species resulting from acetamiprid seed treatment. T-REX approximates acute exposure from seed treatment using avian and mammalian Nagy doses ($mg\ ai\ bw^{-1}\ day^{-1}$), and also utilizes an approach analogous to the LD_{50}/ft^2 analyses done for granular applications. Chronic exposures are estimated based on the maximum seed application rate ($mg\ ai/kg\ seed$), which can be compared directly to estimated dietary-based chronic dietary toxicity endpoints to estimate risks.

13.1.C. Exposure to Terrestrial Plants

EECs for terrestrial plants inhabiting dry and wetland areas are derived using the program TERRPLANT (version 1.2.2, 12/26/2006) (USEPA, 2006). This model uses estimates of pesticides in runoff and spray drift to calculate EECs. EECs are based upon solubility, application rate and minimum incorporation depth. AgDRIFT may also be used to assess exposure to spray drift.

13.1.D. Exposure to Spray Drift

Two spray drift models, AgDISP and AgDRIFT, are used to assess exposures of aquatic and terrestrial organisms to acetamiprid deposited in terrestrial and aquatic habitats by spray drift. AgDrift (version 2.01; dated 5/24/2001)(Spray Drift Task Force Spray Software) is the model most commonly used to simulate spray drift into terrestrial and aquatic environments. AgDISP (version 8.13; dated 12/14/2004) (Teske and Curbishley, 2003) is used when a parameter needs to be modeled that is not available in AgDRIFT. Spray drift analysis will be an important part of the analysis in defining the potential area of effects for endangered species.

13.1.E. Exposure to Terrestrial Plants from Residues in Irrigation Water

Non-target crops may be exposed to contaminated irrigation waters from surface water or shallow ground water containing acetamiprid. The potential risks to plants when exposed to irrigation water contaminated with acetamiprid will be estimated for both ground water and surface water irrigation sources. The EECs for ground water and surface water will be calculated using SCIGROW and PRZM/EXAMs, respectively. Comparisons will be made to the most sensitive endpoint from the vegetative vigor study assuming that runoff of irrigation water does not occur.

13.1.F. Exposure from Applications to Individual Trees

There is no currently approved model for estimating potential exposure to organisms from tree injection or bark treatment. A screening-level estimate of exposure will be used in the assessment to determine whether a more in-depth analysis of this use pattern is needed due to the potential for risk to organisms. The method used to estimate exposure in the terrestrial environment is discussed in a recently completed assessment in EFED and the screen is based on the following assumptions (USEPA, 2010b). The aquatic risk assessment methodology was developed for this problem formulation.

(1) Aquatic Risk Assessment

- a. The total mass of chemical applied to the trees on one acre is assumed to be an application rate. PRZM/EXAMs will be used to estimate potential exposure from applications to bark of trees. Spray drift will be assumed to be minimal. Aquatic exposure due to tree injections will be assumed to be minimal.

(2) Concentration of chemical in leaves for Terrestrial Risk Assessment

- a. Leaf concentration was estimated by assuming that 100% of the chemical was translocated to the leaves. Leaf mass was estimated using allometric equations developed for blue oak trees presented by the USDA Forest Service (Karlick and McKay, 2002). The following equations are used to evaluate risk to terrestrial organisms.

EEC = total mass of chemical applied / leaf mass on tree.

$$\text{Leaf mass (g)} = 1.78x^2 - 12.4x - 108.5$$

x = tree circumference at breast height (cm)

Pesticide concentration on leaves was converted to dose by assuming that birds consume 114% and mammals consume 95% of their body weight daily using the following equation:

$$\begin{aligned} &\text{Body weight adjusted EEC for residues on leaves mg/kg bw} \\ &= X \text{ mg/kg leaf} \times 1.14 \text{ or } 0.95 \text{ kg leaf/kg-bw} \end{aligned}$$

13.2. Measures of Effect

Ecological effects data are used as measures of direct and indirect effects to biological receptors. Effects data are obtained from registrant-submitted studies or from literature studies identified by the ECOTOX database. The acute measures of effect used for animals in this assessment are the LD₅₀, LC₅₀ and EC₅₀. LD stands for "Lethal Dose", and LD₅₀ is the amount of a material, given all at once, that is estimated to cause the death of 50% of the test organisms. LC stands for "Lethal Concentration" and LC₅₀ is the concentration of a chemical that is estimated to kill 50% of the test organisms. EC stands for "Effect Concentration" and the EC₅₀ is the concentration of a

chemical that is estimated to produce a specific effect in 50% of the test organisms. Endpoints for chronic measures of exposure for listed and non-listed animals are the NOAEL/NOAEC. NOAEL stands for "No Observed-Adverse-Effect-Level" and refers to the highest tested dose of a substance that has been reported to have no harmful (adverse) effects on test organisms. The NOAEC (*i.e.*, "No-Observed-Adverse-Effect-Concentration") is the highest test concentration at which none of the observed effects were statistically different from the control. For non-listed plants, only acute exposures are assessed (*i.e.*, EC₂₅ for terrestrial plants and EC₅₀ for aquatic plants); for listed plants either the NOAEC or EC₀₅ is used.

Where available, sublethal effects observed in both registrant-submitted and open literature studies will be evaluated qualitatively. Such effects may include behavioral changes (*e.g.*, lethargy and changes in coloration). However, quantitative assessments of risks are limited to those endpoints that can be directly linked to the Agency's assessment endpoints of impaired survival, growth and reproduction.

In the absence of taxa-specific data, the assessment of risk for direct effects to non-target organisms makes the assumption that toxicity of acetamiprid to birds is similar to terrestrial-phase amphibians and reptiles. The same assumption is made for fish and aquatic-phase amphibians. In the absence of data for either acute or chronic effects, the conservative assumption will be to presume that acetamiprid is toxic.

13.3. Integration of Exposure and Effects

Risk characterization is the integration of exposure and ecological effects characterizations to determine the potential ecological risk from the registered uses of acetamiprid and the likelihood of direct and indirect effects to non-target organisms in aquatic and terrestrial habitats. The exposure and toxicity (effects) data are integrated in order to evaluate the risks of adverse ecological effects on non-target species. For the assessment of acetamiprid, the risk quotient (RQ) method is used to compare exposure and measured toxicity values. EECs are divided by acute and chronic toxicity values. The resulting RQs are then compared to the Agency's Levels of Concern (LOCs) (USEPA, 2004b)(**Appendix F**). These criteria are used to indicate when acetamiprid use, as directed on the labels, has the potential to cause adverse direct or indirect effects to non-target organisms. In addition, incident data from the EIIS will be considered as part of the risk characterization.

13.3.A. Deterministic and Probabilistic Assessment Methods

The quantitative assessment of risk will primarily depend on the deterministic point-estimate (RQ) based approach described in the risk assessment. Depending on the extent of refinement needed by the risk manager, risk estimates may be further refined using probabilistic tools that the Agency has developed. These tools have been reviewed by FIFRA Scientific Advisory Panels²² and have been deemed as an appropriate means of refining assessments where deterministic approaches have identified risks. Newer tools may be available to assess the routes

²² <http://vwww.epa.gov/scipoly/sap/index.htm>

of exposure and will be applied as appropriate in Registration Review.

13.3.B. Endocrine Disruptor Screening Program

As required by FIFRA and FFDCA, EPA reviews numerous studies to assess potential adverse outcomes from exposure to chemicals. Collectively, these studies include acute, sub-chronic and chronic toxicity, including assessments of carcinogenicity, neurotoxicity, developmental, reproductive, and general or systemic toxicity. These studies include endpoints which may be susceptible to endocrine influence, including effects on endocrine target organ histopathology, organ weights, estrus cyclicity, sexual maturation, fertility, pregnancy rates, reproductive loss, and sex ratios in offspring. For ecological hazard assessments, EPA evaluates acute tests and chronic studies that assess growth, developmental and reproductive effects in different taxonomic groups. As part of its most recent registration decision, EPA reviewed these data and selected the most sensitive endpoints for relevant risk assessment scenarios from the existing hazard database. However, as required by FFDCA section 408(p), acetamiprid is subject to endocrine screening as part of the Endocrine Disruptor Screening Program (EDSP).

EPA has developed the EDSP to determine whether certain substances (including pesticide active and other ingredients) may have an effect in humans or wildlife similar to an effect produced by a “naturally occurring estrogen, or other such endocrine effects as the Administrator may designate.” The EDSP employs a two-tiered approach to making the statutorily required determinations. Tier 1 consists of a battery of 11 screening assays to identify the potential of a chemical substance to interact with the estrogen, androgen, or thyroid (E, A, or T) hormonal systems. Chemicals that go through Tier 1 screening and are found to have the potential to interact with E, A, or T hormonal systems will proceed to the next stage of the EDSP where EPA will determine which, if any, of the Tier 2 tests are necessary based on the available data. Tier 2 testing is designed to identify any adverse endocrine-related effects caused by the substance, and establish a dose-response relationship between the dose and the E, A, or T effect.

Under FFDCA section 408(p), the Agency must screen all pesticide chemicals. Between October 2009 and February 2010, EPA issued test orders/data call-ins for the first group of 67 chemicals, which contains 58 pesticide active ingredients and 9 inert ingredients. Acetamiprid is not among the group of 58 pesticide active ingredients on the initial list to be screened under the EDSP. Accordingly, as part of Registration Review, EPA will issue future EDSP orders/data call-ins, requiring the submission of EDSP screening assays for acetamiprid. For further information on the status of the EDSP, the policies and procedures, the list of 67 chemicals, future lists, the test guidelines and the Tier 1 screening battery, please visit our website.²³

13.3.C. Endangered Species Assessment

Consistent with the Agency’s responsibility under the Endangered Species Act (ESA), the Agency will evaluate risks to Federally-listed threatened and/or endangered (listed) species from registered uses of acetamiprid. This assessment will be conducted in accordance with the

²³ <http://www.epa.gov/endo/>

Overview Document (USEPA, 2004b), provisions of the ESA, and the Services' Endangered Species Consultation Handbook (USFWS/NMFS, 1998).

The action area is used to identify all listed (threatened and endangered) species and designated critical habitat that could be affected by the Federal action. The Federal action is the authorization or registration of pesticide use or uses as described on the label(s) of pesticide products containing a particular active ingredient. The action area is defined by the Endangered Species Act as, "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.2). Based on an analysis of the Federal action, the action area is defined by the actual and potential use of the pesticide.

In the case of nationwide ecological risk assessment conducted for acetamiprid under Registration Review, the action area will encompass the entire United States and its territories. The purpose of defining the action area as the entire US and its territories is to ensure that the initial area of consideration encompasses all areas where acetamiprid may be used now and in the future, including the potential for off-site transport via spray drift and downstream dilution. Additionally, the concept of a nationwide action area takes into account the potential for direct and indirect effects and any potential modification to critical habitat based on ecological effect measures associated with reduction in survival, growth, and reproduction, as well as the full suite of sublethal effects available in the effects literature. It is important to note that the nationwide action area does not imply that direct and/or indirect effects and critical habitat modification are expected to or are likely to occur over the full extent of the action area, but rather to identify all listed species and critical habitat that may potentially be affected by the action. The Agency will use more rigorous analysis including consideration of available land cover data, toxicity data, and exposure information to determine areas where individual listed species and designated critical habitat may be affected or modified via endpoints associated with reduced survival, growth, or reproduction.

13.3.A. Risk Assessment of Pollinators

The EPA is aware of registrant-submitted studies and other open literature studies regarding the potential effects of neonicotinoid insecticides on insect pollinators and specifically on honey bees. EPA is also aware of concerns regarding the potential association between the use of nitroguanidine-substituted neonicotinoids and honey bee losses characterized as Colony Collapse Disorder (CCD) and the broader phenomenon of declining honey bee health globally. While a number of factors (*e.g.*, nutrition, habitat loss, disease, parasites, bee management practices, and pesticides) have been hypothesized, no single factor has yet to be identified as the "cause" of declines.

As part of the review process, EPA examines the effects of chemicals on bees based on both laboratory and when appropriate, field studies to determine whether individual bees and entire bee colonies may be affected by the use of a compound and to support risk mitigation decisions. EPA is currently revising its process for assessing pesticide risks to bees to reflect advancements in the state of the science that underlie bee exposure and effects assessments. Interim guidance

(USEPA 2011²⁴) on factors to consider when evaluating exposure and effects to bees is available to ecological risk assessors. In 2012, EPA will present to a FIFRA Scientific Advisory Panel (SAP) a proposed process for quantifying risks to honeybees and identifying exposure and effect studies needed to inform that process. Based on input from the SAP, EPA will incorporate its revised assessment process to quantify risks to bees in a similar manner as that used to evaluate risks to other taxa.

As EPA's understanding of the science evolves, its need for data and its evaluation of those data will evolve as well. Therefore, as with all taxa, EPA reserves the right to require additional data it deems necessary to inform its understanding of potential ecological risks and support its associated risk management decisions. Additional data requirements for pollinators may extend beyond those identified in problem formulations and preliminary work plans written in support of the Registration Review process.

13.3.B. Human Health Drinking Water Assessment

In order to bring the drinking water assessment up to date with current data, models and simulation model guidance, a new drinking water assessment will be conducted to support future human health dietary risk assessments of acetamiprid. The drinking water assessment will incorporate model estimates of acetamiprid and unextracted residues in surface water and groundwater. Concentrations of acetamiprid and unextracted residues in surface waters will be estimated using PRZM and EXAMs (see description in Section 13.1.A), and concentrations in ground water will be estimated using SCIGROW (see description in Section 13.1.A).

The drinking water assessment will also include available surface and ground water monitoring data with consideration of changes in use patterns that may have occurred. States are encouraged to submit monitoring data for review.

14. Preliminary Identification of Data Gaps

14.1. Fate

Several fate studies are needed to better characterize the environmental fate and transport of acetamiprid. The studies listed below will decrease the uncertainty in determining the potential exposure to the pesticide. EFED recommends the following studies be required:

- Aerobic Aquatic Metabolism (OPPTS Guideline 835.4300); test substance acetamiprid, data needed for one sediment
- Anaerobic Aquatic Metabolism (OPPTS Guideline 835.4400); test substance acetamiprid, data needed for one sediment
- Column and Aged Column Leaching Study (OPPTS Guideline 835.1240); Parent and

²⁴ USEPA. 2011. Pesticides: Science and Policy. Interim Guidance on Honey Bee Data Requirements. http://www.epa.gov/pesticides/science/efed/policy_guidance/team_authors/terrestrial_biology_tech_team/honeybee_data_interim_guidance.htm

representative TEP for formulations applied using trenching, rodding, soil injection, and soil excavation techniques

- Aquatic Field Dissipation (OPPTS Guidelines 835.6200); test substance is representative end-use product used on cranberries
- Aerobic Soil Metabolism (OPPTS Guideline 835.4100), Test substance acetamiprid additional information on MRIDs 46255603, 44651881, 44699101, 44651879 or identity of unextracted residues
- Aerobic Aquatic Metabolism (OPPTS Guideline 835.4300), Test substance acetamiprid, additional information for MRID 44988513 or identity of unextracted residues
- Anaerobic Aquatic Metabolism (OPPTS Guideline 835.4400), Test substance acetamiprid additional information for MRID 44988512 or identity of unextracted residues
- Environmental Chemistry Methods: Water (OPPTS Guideline 850.7100), parent and major degradates IM 1-2, IM 1-5, IM 1-4, IM 1-3, and IC-0

In addition to the above studies, the following studies would provide additional information that would reduce uncertainty in the risk assessment or assist the public in monitoring:

- Terrestrial Field Dissipation (OPPTS Guideline 835.6100); test substance acetamiprid

Table 14-1 summarizes the fate data requirements for acetamiprid. A rationale discussing the need for each study is also provided below.

Table 14-1. Summary of Submitted Environmental Fate Studies, Study Classifications and Data Gaps for Acetamiprid and Its Degradates

| OPPTS Guideline | MRID Test Material | Study Classification | Comments on Study Classification | Data Gap? | Are additional data needed for risk assessment? | Comments |
|---|--------------------|----------------------|--|-----------|---|----------|
| Hydrolysis 835.2120 (161-1) | 44651876 Parent | Acceptable | Values may be used in risk assessment. | No | No | -- |
| | 44651877 | Supplemental | Screening study at 50°C. Shown to be stable. | | | |
| Aqueous Photolysis 835.2240 (161-2) | 44988509 Parent | Acceptable | Values may be used in risk assessment | No | No | -- |
| | 44988511 Parent | Valid | -- | | | |

| OPPTS Guideline | MRID Test Material | Study Classification | Comments on Study Classification | Data Gap? | Are additional data needed for risk assessment? | Comments |
|--|-----------------------------------|--|--|----------------------|--|---|
| Soil Photolysis 835.2410 (161-3) | 48563501 Parent | Supplemental | Unable to calculate half-lives due to microbial activity being higher in dark control than in irradiated sample. | Yes | No | When microbial degradation is present it is expected to be a more important degradation pathway than photolysis. Additional data are not expected to impact the risk assessment. |
| Aerobic Soil Metabolism 835.4100 (162-1) | 46255603 Parent | Supplemental | High unextracted residues | Yes | Yes | All of the studies contained high levels of unextracted residues and maximum amounts of residues observed may be higher than observed. In absence of additional data, unextracted residues will be included when estimating half-lives for use in aquatic modeling. |
| | 44651881 Parent | Supplemental | | | | |
| | 44699101 Parent | Supplemental | | | | |
| | 44651880 Parent | Supplemental – Not for use in modeling | | | | |
| | 44651879 Parent | Acceptable | | | | |
| Anaerobic Soil Metabolism 835.4200 (162-2) | 48554501 Parent | Supplemental- Not for use in modeling | Dissolved oxygen concentrations were 1.9 mg/L | Yes | No | While data are required by 40 CFR Part 158.1300, additional data are not expected to impact the risk conclusions. |
| Aerobic Aquatic Metabolism 835.4300 (162-4) | 44988513 Parent | Acceptable | Data only available on one sediment. High levels of unextracted residues. | Yes | Yes | For the study available on one sediment there were significant unextracted residues. In the absence of additional data, unextracted residues will be included when estimating half-lives for use in aquatic modeling. If data are only available on one sediment the estimated value will be multiplied by three. |

| OPPTS Guideline | MRID Test Material | Study Classification | Comments on Study Classification | Data Gap? | Are additional data needed for risk assessment? | Comments |
|---|-----------------------------------|---------------------------------|--|----------------------|--|---|
| Anaerobic Aquatic Metabolism 835.4400 (162-3) | 44988513 Parent | Acceptable | Data only available on one sediment. High levels of unextracted residues. | Yes | Yes | For the study available on one sediment there were significant unextracted residues. In the absence of additional data, unextracted residues will be included when estimating half- lives for use in aquatic modeling. If data are only available on one sediment the estimated value will be multiplied by three. |
| Adsorption/ Desorption 835.1230 (163-1) | 44651883 Parent | Acceptable | Test material was parent | No | No | -- |
| | 44651885 IM-1-4 | Valid | Test material was IM- 1-4 | | | |
| Leaching and Aged Column Leaching 835.1240 | -- | --- | -- | Yes | Yes | Data are needed to predict the risk of contamination of ground water from uses involving trenching, rodding, soil excavation, and subslab injection. |
| Terrestrial Field Dissipation 835.6100 | 44988514 Parent | Supplemental | IM-1-2 not stable, residues in plants not measured | Yes | No | Additional data are not expected to impact the risk assessment conclusions. |
| | 44988515 Parent | Supplemental | IM-1-2 not stable. Residues in plants not measured | | | |
| | 44988625 Parent | Supplemental | No storage stability data | | | |
| 835.6200 Aquatic Field Dissipation | -- | -- | -- | Yes | Yes | Acetamiprid may be used on cranberries and therefore, applied directly to water. Therefore, data on aquatic field dissipation of acetamiprid are needed. |

| OPPTS Guideline | MRID Test Material | Study Classification | Comments on Study Classification | Data Gap? | Are additional data needed for risk assessment? | Comments |
|--|--|----------------------|----------------------------------|-----------|---|--|
| Bioconcentration Factor 850.1730 | -- | -- | -- | No | No | Not required because K_{OW} is < 1000 (40 CFR Part 158.630) |
| Environmental Chemistry Method: Water 850.7100 | 44988536 Parent and Major Degradates | Satisfactory | -- | No | No | An ECM and ILV are needed with a limit of quantitation (LOQ) for the parent below 2.5 µg/L that may be used in monitoring. Available methods have an LOQ of 0.1 µg/L. ¹ |
| Environmental Chemistry Method: Soil and sediment 850.7100 | 44988516/4 4988517 Parent and Major Degradates | Satisfactory | -- | No | No | |

Abbreviations: ECM=Environmental Chemistry Method; ILV=independent laboratory Validation

¹ The LOQ was based on the NOAEC for mysid (NOAEC = 0.0025 mg ai/L) and an LOC of 1 (MRID 44651873).

14.1.A. Rationales for Requesting Fate Studies

- Anaerobic Aquatic Metabolism (OPPTS Guideline 835.4400); test substance acetamiprid, data needed for one sediment and additional data needed on the identity of unextracted residues for MRID 44988513
- Aerobic Aquatic Metabolism (OPPTS Guideline 835.4300); test substance acetamiprid, data needed for one sediment and additional data needed on the identity of unextracted residues for MRID 44988513
- Aerobic Soil Metabolism (OPPTS Guideline 835.4100), Test substance acetamiprid additional information on MRIDs 46255603, 44651881, 44699101, 44651879 regarding the identity of unextracted residues

Data on aerobic aquatic and anaerobic aquatic metabolism (OPPTS Guidelines 835.4300 and 835.4400) in two sediments each are recommended; however, data are only available for each type of test in one sediment. This could result in underestimation or overestimation of typical half-lives in such media. Because only a single data point (half-life) is available for each of these studies, model input half-lives are assumed to equal three times the measured values, in keeping with standard EFED procedure (USEPA, 2009b). Having half-lives from additional studies would allow estimation of 90th percentile confidence bounds on the mean half-lives for use in modeling, which would probably be less conservative. A total toxic residue (including parent, IM-1-4, and unextracted residues) approach is used in modeling for the ecological risk assessment. Half-life values used in modeling were high (*i.e.*, >1500 days), and as a

consequence EECs are conservative. These data gaps will also influence the estimated drinking water concentrations (EDWCs).

The identity of unextracted residues is unknown in a number of submitted studies where unextracted residues made up greater than 10% of applied radioactivity (<1 to 40%). This creates significant uncertainty for the risk assessment. Due to the uncertainty in the identity of these residues, in the absence of additional data, it will be assumed that the unidentified residues are residues of concern in estimating the half-lives of total residues of concern. It will be assumed that unextracted residues have similar toxicity to the parent compound. In a recently completed ecological risk assessment, the parent, IM-1-4, and unextracted residue risk quotients were up to twice the values of those for the parent and IM-1-4 only (USEPA, 2011a). For the drinking water assessment, inclusion of unextracted residues resulted in EDWCs that were 4 to 35 times the EDWCs based on parent alone (USEPA, 2011, D394234, D394479). If the identity of the unextracted residues were known, the degradate profile would likely change. Additional studies that make an effort to ensure that all residues that can be extracted from soil and sediment are extracted²⁵, and that those residues are identified, could significantly reduce the uncertainty resulting from having significant amounts of unextracted and unidentified residues in metabolism studies.

In all fate studies, efforts should be made to extract all residues from soil and sediment.

- Column and Aged Column Leaching Study (OPPTS Guideline 835.1240) and Aged Column Leaching; Parent and representative TEP for formulations used as termiticides

Acetamiprid may be used to control termites and is applied via trenching, rodding (boring a series of relatively evenly spaced holes in the soil adjacent to the structure and back-filling the holes with termiticide and soil), sub slab injection, soil excavation, or injected into piping or similar systems around buildings. There is a particular concern for leaching of pesticides applied under the soil surface as other chemicals have been found at high levels when applied in this manner (USEPA, 1999). The pesticide may be applied below levels where microbial activity is high, resulting in greater persistence. There is also a concern that the formulation may enhance the movement of the pesticide in soils as the entire formulation is applied under the soil surface. The environmental risk concern is that the increased mobility may potentially allow acetamiprid to reach drinking water wells and in-ground drainage systems such as French drains, which are used to drain water away from basement walls, and tile drains, which are used to lower the water table in residential and other areas. Both the French and tile drains typically convey water through storm-water drainage-ways to water bodies rather than to wastewater treatment facilities. In order to better understand the risk of these uses EFED requests column leaching studies be conducted on the parent and representative formulations (including a formulation that is applied in foam) that are used in this manner. If the formulation indicates that the formulation is more mobile than the parent, EFED believes it would be prudent to request a radio-labeled aged soil

²⁵ A reasonable effort to extract all residues would include employing a variety of extraction solvents and testing extraction efficiencies for known analytes. Use of acids and bases if they do not alter the chemical of interest may also be used.

column leaching study that determines how fast the formulation components lose their ability to enhance acetamiprid mobility and estimates the rate of decay in mobility enhancement. EFED envisions such a study consisting of a radio-labeled aged soil column leaching study using acetamiprid formulation aged for different lengths of time (for example, 0 months, 1 month, 3 months, 6 months, and 1 year). If such a study is performed, EFED recommends that acetamiprid and acetamiprid degradates be quantified. It would also be recommended that multiple soil types varying in organic matter content be studied including a loamy sand and a silt loam or sandy loam. Ideally, the studies would be conducted on soils where adsorption/desorption data for the parent were also available and the soils were shown to be vulnerable soils.

- Aquatic Field Dissipation (OPPTS Guidelines 835.6200); test substance is representative end-use product used on cranberries

Acetamiprid may be used on cranberries and applied directly to water. 40 CFR § 158.1300 recommends that aquatic field dissipation studies be available when products may be applied directly to water or when there is a potential for aquatic exposure. Data from aquatic field dissipation studies are needed to get a better understanding of the environmental fate of acetamiprid in aquatic systems. In the absence of additional data, EFED will use available data to predict the fate of acetamiprid in cranberry bogs.

14.1.B. Discussion of Additional Fate Data to Reduce Uncertainty or Aid in Monitoring

- Terrestrial Field Dissipation (OPPTS Guideline 835.6100), Test substance acetamiprid formulation

Terrestrial field dissipation studies are only available examining applications of wettable powders. Studies conducted using other formulations such as soluble concentrates, emulsifiable concentrates, and termiticide formulations would reduce the uncertainty on the effect of the formulation on the environmental transport of acetamiprid. This would be particularly helpful for termiticide formulations that are directly injected below the soil surface. Additionally, IM 1-2 was converted to IM 1-4 during storage and IM 1-4 was not stable for two of the studies with storage stability data. In a third study, storage stability data were not available. This results in uncertainty in the maximum residues of IM 1-2 and IM 1-4 that would occur in the environment. This is particularly important as concentrations of IM 1-4 were sometimes higher than concentrations of the parent. Additional data to resolve these uncertainties in the terrestrial field dissipation results would reduce the uncertainty in the risk assessment.

- Environmental Chemistry Methods (OPPTS Guideline 850.7100)

Environmental chemistry methods for parent and degradates using a variety of instruments would aid the public in being able to monitor for acetamiprid and its degradates in use areas. These methods could be specific to acetamiprid, or multiresidue methods for multiple

compounds that include acetamiprid and/or its degradates. These methods would add to the methods already available for monitoring.

14.2. Ecological Effects

Several ecological effects studies on acetamiprid are needed to better assess the potential risk of exposure to non-target organisms. **Table 14-2** summarizes the data that have been submitted for the parent compound and also highlights additional studies that are needed for risk assessment. Additional rationale for requesting specific studies is outlined below.

The following studies are needed to decrease uncertainty in risk estimation and characterization of acetamiprid:

Avian Toxicity

- *Avian Reproductive Toxicity Study with Mallard Duck – OCSPP 850.2300 [1 Study]*

An avian chronic reproductive toxicity study (MRID 46369201) yielded a non-definitive endpoint. A NOAEC value was not derived in the study and effects were recorded at all concentrations tested. Establishment of a NOAEC is essential if the study is to be used in risk assessment. Therefore the extent of possible chronic risk to birds cannot be determined until an additional avian reproduction study (OCSPP 850.2300) is submitted. EFED reviewed this avian reproduction study in August, 2005 and classified it as supplemental since it did not establish a NOAEC because statistically significant effects on male body weight gain were observed at all treatment levels. EFED issued an additional document in 2012 (D325745) reconfirming that the study remains classified as supplemental. Therefore, additional data on avian reproductive toxicity in mallard ducks are recommended.

Aquatic Invertebrate Toxicity

- *28-day Chironomid Toxicity Test – Non-guideline [1 Study]*

Based on a search of the European Pesticide Properties Database (PPDB), a 28-day chronic study with the non-biting midge (*Chironomidae*) exists. If this is a registrant-sponsored study, EFED would appreciate submission of this study to better assess toxicity to sensitive non-target arthropods. Submission of these data could potentially be used to avoid relying on an acute-to-chronic ratio for estimating chronic toxicity to chironomids. If this study is not available, a new study is not being requested for risk assessment.

- *Freshwater invertebrate, acute toxicity, Daphnia – OCSPP 850.1010 Test Substance EPA Registration Number 8033.116 and TEP for products used on cranberries*

40 CFR § 158.630 footnote 9 recommends that acute aquatic toxicity testing data be obtained when, “An ingredient in the end-use formulation other than the active ingredient is expected to

enhance the toxicity of the active ingredient or to cause toxicity to aquatic organisms.” EPA Registration Number 8033-116 contains both acetamiprid and bifenthrin, which is toxic to aquatic organisms, and may be deposited directly into the aquatic environment via spray drift. Submission of these data will allow evaluation of the likelihood of risk to aquatic invertebrates exposed to this product via spray drift. Additionally, products with applications to cranberries may have direct applications to water. OCSPP 850.1010 on representative typical end-use products for these products are recommended.

Terrestrial Invertebrate Toxicity

- *Honeybee Toxicity on Foliage Residue Study – OCSPP 850.3030 [1 Study]*

Based on current Agency policy, an acceptable honeybee foliage residue study (OCSPP 850.3030) is recommended when the acute contact toxicity to bees is $<11 \mu\text{g}/\text{bee}$, as in the case of acetamiprid. A toxicity of residues on foliage study (MRID 44651875) was submitted for acetamiprid but was deemed unacceptable. While this study design does not address the systemic nature of acetamiprid, it is requested to provide a better understanding of the residual toxicity associated with foliar applications. It should be noted that a second foliage residue toxicity study was submitted in 2001 (MRID 45346901), but has not yet been reviewed by EFED.

- *Honeybee Larval Toxicity Study – Non-guideline [1 Study]*

Since at least one of the registered uses of acetamiprid is as an ovicide, potential effects to young bees could exist. Toxicity studies with acetamiprid have only been submitted for young adult bees and do not address possible effects on brood (larvae and pupae) survival. In addition, since acetamiprid is a systemic fungicide, it may be transferred to pollen and nectar and subsequently brought back to hive where larvae and pupae may be exposed. Honeybee brood studies are not currently a data requirement in the U.S., however, a non-guideline honeybee larval toxicity study is recommended as a special study (see **Appendix F** for DCI justification table).

- *Nectar and Pollen Residue Study – Non-guideline [1 Study]*

Acetamiprid is a systemic compound, and there is uncertainty as to the extent that residues may translocate to pollen and nectar, where honeybee larvae and pupae may be exposed. However, this route of exposure will only be considered a potential concern if acetamiprid exhibits significant toxicity to larval bees. Therefore, EFED recommends residue studies of pollen and nectar (and other plant products, as appropriate) of pollinator-attractive crops on which the compound is registered for use (see **Appendix F** for DCI justification tables) pending the results of the non-guideline larval toxicity test. If the screening-level acute RQ exceeds 0.4 (based on larval toxicity data), then the pollen and nectar residue study may be requested. EFED will also evaluate the HED magnitude of residue toxicity data to determine whether it can be used to supplement or replace studies estimating residues of acetamiprid on plant pollen and nectar.

- *Beneficial Insect Studies – Non-guideline [2 Studies]*

Two beneficial insect studies were identified in the European PPDB: one study with the parasitoid aphid (*Aphidius rhopalosiphi*) and one study with the predatory mite (*Typhlodromus pyri*). Both studies appear to report mortality endpoint data. If these studies were sponsored by the registrant, EFED would appreciate that they be submitted in order to characterize effects to terrestrial invertebrates.

Terrestrial Plant Toxicity

- *Tier II Seedling Emergence Study – OCSPP 850.4100 [1 Study]*

The Tier II seedling emergence study in terrestrial plants (OCSPP 850.4100; MRID 44988413) did not measure plant weight, which is one of the two major endpoints in this type of study, resulting in uncertainty regarding the effects of acetamiprid on plant growth. Therefore, an additional Tier II plant study should be submitted which includes both plant weight and shoot length endpoint data from all 10 recommended species.

Table 14-2. Summary of Submitted Aquatic and Terrestrial Effects Studies and Data Gaps for Parent Acetamiprid.

| Guideline | Description—Test Substance | MRID(s) | Study Classification | Are additional data needed for risk assessment? | Comments |
|------------------------------------|---|----------|----------------------|---|---|
| Avian and Mammalian Testing | | | | | |
| 850.2100 | Avian acute oral toxicity, waterfowl—TGAI | 44651859 | Acceptable | No | |
| 850.2100 | Avian acute oral toxicity, passerine species—TGAI | 48407701 | Acceptable | No | |
| 850.2200 | Avian dietary toxicity, waterfowl species—TGAI | 44651861 | Supplemental | No | Definitive study tested less than five concentrations; mortalities occurred. But available data suggest that dietary toxicity is low. |
| 850.2200 | Avian dietary toxicity, upland game bird—TGAI | 44651860 | Supplemental | No | Definitive study tested less than five concentrations; mortalities occurred. But available data suggest that dietary toxicity is low. |
| 850.2300 | Avian reproduction, waterfowl species—TGAI | 46369201 | Supplemental | Yes | NOAEC not established due to effects on male body weight gain at all test levels. |
| 850.2300 | Avian reproduction, upland game bird species—TGAI | 46555601 | Acceptable | No | |
| 850.2400 | Wild mammal toxicity—TGAI | None | N/A | No | Not triggered based on ecotoxicity data, predicted EECs, fate properties, and use pattern criteria. |
| 850.2500 | Simulated or actual field testing—TEP | None | N/A | No | Not triggered based on ecotoxicity data, predicted EECs, fate properties, and use pattern criteria. |

| Guideline | Description—Test Substance | MRID(s) | Study Classification | Are additional data needed for risk assessment? | Comments |
|-------------------------------|---|----------|----------------------|---|---|
| Aquatic Animal Testing | | | | | |
| 850.1010 | Freshwater invertebrate, acute toxicity, <i>Daphnia</i> —TGAI | 44651866 | Supplemental | No | Water hardness during test (216-219 mg/L CaCO ₃ is higher than guideline recommended value of 180 mg/L) |
| 850.1010 | Freshwater invertebrate, acute toxicity, <i>Daphnia</i> —TEP | | | Yes | Data needed on products that could result in spray drift into aquatic water bodies that contain multiple active ingredients. EPA Registration Number 8033-116 is a liquid formulation that may be applied to soybean by aerial or ground spray. Additionally, products applied to cranberries may be applied directly to water. |
| 850.1020 | Freshwater invertebrate, acute toxicity, Amphipod—TGAI | 45932501 | Supplemental | No | |
| Non-guideline | Freshwater invertebrate, acute toxicity, Non-biting midge (Chironomidae)—TGAI | 45916201 | Supplemental | No | |
| 850.1025 | Estuarine/Marine Mollusk acute toxicity—TGAI | 44988410 | Acceptable | No | |
| 850.1035 | Estuarine/Marine crustacean acute toxicity—TGAI | 44651869 | Acceptable | No | |
| 850.1075 | Freshwater fish, acute toxicity, warm water species—TGAI | 44651863 | Acceptable | No | |
| 850.1075 | Freshwater fish, acute toxicity, cold water species—TGAI | 44651864 | Acceptable | No | |
| 850.1075 | Estuarine/Marine fish acute toxicity—TGAI | 44988411 | Acceptable | No | |
| 850.1300 | Freshwater invertebrate, reproduction test—TGAI | 44651871 | Acceptable | No | |
| 850.1350 | Estuarine/marine invertebrate, reproduction test—TGAI | 44651873 | Acceptable | No | |
| Non-guideline | 28-day toxicity to non-biting midge (Chironomidae)—TGAI | None | N/A | No* | This study was identified in the European Pesticide Properties Database. If this is a registrant-sponsored study, submission of this study to EPA is requested. If this study is not available, a new study is not being recommended. |
| 850.1400 | Freshwater fish, early life stage test—TGAI | 44651872 | Supplemental | No | |

| Guideline | Description—Test Substance | MRID(s) | Study Classification | Are additional data needed for risk assessment? | Comments |
|-------------------------|---|---------|----------------------|---|--|
| 850.1400 | Saltwater fish, early life stage test—TGAI | None | N/A | No | Test not triggered under 40 CFR §158.630 |
| 850.1500 | Freshwater fish life cycle test | None | N/A | No | Data requirement triggered because EEC > 0.1 of NOAEC of mysid from life cycle tests (EEC = 0.7 mg/L and NOAEC = 19.2 mg ai/L). However, EECs and the fish early life stage toxicity NOAEC (19.2 mg/L) are not similar. Additionally, NOAECs from early life stage and fish full life cycle studies on thiacloprid (a neonicotinoid with a similar structure to acetamiprid) were similar; also, the reproductive NOAECs and parental NOAECs from avian and mammalian studies with acetamiprid were similar. Weight of evidence suggests that this study will not provide any critical new information (see discussion below). |
| 850.1500 | Estuarine/marine fish life cycle test | None | N/A | No | |
| 850.1950 | Simulated or actual field testing for aquatic organisms | None | N/A | No | Higher tier testing to address risk uncertainties have not been identified at this time |
| Sediment Testing | | | | | |
| 850.1735 | Whole sediment 10-d freshwater invertebrate—TGAI | None | N/A | No | Data requirement not triggered: $K_d < 50$ $\text{Log } K_{ow} < 3$ $K_{oc} < 1,000$ |
| 850.1740 | Whole sediment 10-d estuarine/marine invertebrate—TGAI | None | N/A | No | Data requirement not triggered: $K_d < 50$ $\text{Log } K_{ow} < 3$ $K_{oc} < 1,000$ |
| Agency-wide guideline | Whole sediment chronic freshwater and/or marine invertebrate—TGAI | None | N/A | No | Data requirement not triggered: $K_d < 50$ $\text{Log } K_{ow} < 3$ $K_{oc} < 1,000$ |

| Guideline | Description—Test Substance | MRID(s) | Study Classification | Are additional data needed for risk assessment? | Comments |
|----------------------------------|--|----------------------|----------------------|---|---|
| Terrestrial Invertebrates | | | | | |
| 850.3020 | Honeybee acute contact toxicity—TGAI | 44651874 | Supplemental | No | A definitive LD ₅₀ was not established due to lack of dose response; however, study is sufficient as a trigger for additional tiered bee studies |
| 850.3030 | Honeybee toxicity of residues on foliage—TEP | 44651875 | Invalid | Yes | While this study does not address the systemic nature of acetamiprid, it is recommended to provide a better understanding of the residual toxicity associated with foliar applications. Note: an additional foliage residue toxicity study was submitted (MRID 45346901), but has not yet been reviewed by EFED |
| | | 45346901 | Not Reviewed | N/A | Review of this study could change the recommendation for additional foliage residue toxicity data |
| 850.3040 | Field testing for pollinators | None | N/A | No | |
| Non-guideline | Honeybee semi-field tunnel study—TEP | 45932504 45932505 | Supplemental | No | |
| Non-guideline | Honeybee larval toxicity study—TGAI | None | N/A | Yes | Recommended since acetamiprid is systemic and may be transferred to pollen and nectar and subsequently brought back to hive |
| Non-guideline | Honeybee pollen and nectar residue study—TEP | None | N/A | Yes | Recommended since acetamiprid is systemic and may be transferred to pollen and nectar and subsequently brought back to hive |
| Non-guideline | Toxicity to beneficial insects – parasitoid aphid and predatory mite (2 studies) | None | N/A | No* | These studies were identified in the European Pesticide Properties Database. If they are registrant-sponsored studies, their submission to EPA is requested. However, if these studies are not available, new studies are not being recommended. |

| Guideline | Description—Test Substance | MRID(s) | Study Classification | Are additional data needed for risk assessment? | Comments |
|-----------------------------------|---|----------|----------------------|---|---|
| Terrestrial Plants | | | | | |
| 850.4100 Tier II | Seedling emergence (10 species) —TGAI | 44988413 | Supplemental | Yes [†] | Seedling weight was not measured. Additional study (with 10 recommended plant species) with seedling weight endpoint is recommended. |
| 850.4150 Tier II | Vegetative vigor (10 species) — TGAI | 44988413 | Acceptable | No | Study was acceptable for all plant species tested except for lettuce. Additional data have since been submitted for lettuce. |
| 850.4150 Tier II | Vegetative vigor (10 species) — TGAI | 45921401 | Supplemental | No | This study was submitted to supplement MRID 44988413 |
| Aquatic Plants | | | | | |
| 850.4400 Tier I and/or II | Tier II Aquatic plant growth, vascular plant — TGAI | 44988415 | Acceptable | No | If future proposed registrations result in surface water EECs greater/equal to the highest concentration tested in studies, additional toxicity testing may be recommended. |
| 850.5400 Tier I and/or II | Tier II Aquatic Plant, freshwater green alga species — TGAI | 44988414 | Acceptable | No | |
| 850.5400 Tier I and/or II | Tier II Aquatic Plant, freshwater diatom—TGAI | 44988417 | Acceptable | No | |
| 850.5400 Tier I and/or II | Tier I Aquatic Plant, marine diatom — TGAI | 44988418 | Acceptable | No | |
| 850.5400 Tier I and/or Tier II | Tier II Aquatic Plant, cyanobacterium — TGAI | 44988416 | Acceptable | No | |

* Study is being requested only if it has already been performed and is available from the registrant.

Table 14-3. Summary of Submitted Aquatic and Terrestrial Animal Effects Studies and Data Gaps for Degradates of Acetamiprid.

| Guideline | Description—Test Substance | MRID(s) | Study Classification | Data Gap | Comments |
|------------------------------------|---|----------|----------------------|----------|----------|
| Avian and Mammalian Testing | | | | | |
| 850.2200 | Avian dietary toxicity, waterfowl species—IM-1-4 | 44651862 | Supplemental | No | |
| Aquatic Animal Testing | | | | | |
| 850.1010 | Freshwater invertebrate, acute toxicity, <i>Daphnia</i> —IC-0 | 44988409 | Acceptable | No | |

| Guideline | Description—Test Substance | MRID(s) | Study Classification | Data Gap | Comments |
|---------------|--|----------|----------------------|----------|----------|
| 850.1010 | Freshwater invertebrate, acute toxicity, <i>Daphnia</i> —IM-1-2 | 44651867 | Acceptable | No | |
| 850.1010 | Freshwater invertebrate, acute toxicity, <i>Daphnia</i> —IM-1-4 | 44651868 | Acceptable | No | |
| Non-guideline | Freshwater invertebrate, acute toxicity, Non-biting midge—IM-1-5 | 46255610 | Acceptable | No | |
| 850.1035 | Estuarine/Marine crustacean acute toxicity—IM-1-4 | 44651870 | Acceptable | No | |
| 850.1075 | Freshwater fish, acute toxicity, cold water species—IM-1-4 | 44651865 | Supplemental | No | |
| 850.1300 | Freshwater invertebrate, reproduction test—IM-1-5 | 46255609 | Supplemental | No | |

* Submission of additional data is recommended.

The following studies are technically data gaps but are not deemed necessary for risk assessment of acetamiprid at this time:

- *Avian Dietary Toxicity Studies – OCSPP 850.2200*

Two avian subacute dietary toxicity studies were submitted for acetamiprid (MRID 44651860, bobwhite quail; MRID 44651861, mallard duck). Both studies estimated the LC₅₀ to be greater than the highest concentration tested (>5,000 mg/kg-diet). However, the bobwhite and mallard studies only tested two and three concentrations, respectively. OCSPP 850.2200 guidance states that a minimum of five concentrations of the test substance should be used during avian dietary toxicity definitive tests. Moreover, mortalities were observed at one or more concentration levels in both studies, which triggers full (*i.e.*, five concentrations) definitive tests in accordance with EFED's non-definitive endpoint guidance policy. Additionally, range-finding data were not submitted for the bobwhite quail study, which would help support the "greater than" LC₅₀ result. The mallard duck study was conducted during two different time periods; initially, two test concentrations were evaluated followed by an additional test concentration two months later. However, given that the passerine oral toxicity data is at least one order of magnitude lower (more sensitive) than the avian sub-acute dietary data, requesting additional dietary studies is not likely to change the outcome of the risk assessment. It should also be noted that an avian dietary toxicity study (MRID48844901) of acetamiprid in the zebra finch has recently been submitted and is currently under review.

- *Freshwater Fish Life Cycle Test – OCSPP 850.1500*

40 CFR § 158.630 recommends that a freshwater fish life cycle test be conducted because EECs are greater than 0.1 multiplied by the NOAEC from mysid life cycle test ($0.1 \times \text{NOAEC of Mysid shrimp } 2.5 \mu\text{g ai/L} = 0.25$; maximum EEC = 0.70 mg/L see **Appendix H**). However, reproductive and parental NOAECs in avian and mammalian reproduction studies were similar, suggesting that a reproductive endpoint in fish may also not be more sensitive than the parental endpoints. Additionally, when surface water EECs (0.00072 – 0.70 mg/L) generated in this problem formulation (**Appendix H**) and in previous assessments are compared to the fish early life stage toxicity endpoint for the fathead minnow (19.2 mg ai/L), it appears unlikely that effects to freshwater fish will occur with chronic exposure to acetamiprid at current use rates. In addition, NOAEC values from a fish early life-stage study on rainbow trout (NOAEC=0.918; MRID 44927829) and a fish full life cycle study on fathead minnows (NOAEC=0.718 mg ai/L; MRID 44927904) with another cyano-substituted neonicotinoid, thiacloprid, were similar, suggesting that a fish full life cycle with acetamiprid is not likely to yield a substantially lower NOAEC than the ELS study. Therefore, based on the weight of evidence, requesting a freshwater fish life cycle test is not likely to change the outcome of the risk assessment.

14.2.A. Testing on Typical End-Use Products (TEP)

A Typical End-Use Product is defined in the *Pesticide Assessment Guidelines Subdivision J Hazard Evaluation: Nontarget plants* on Part 120-2(1) on Page 18 as “a pesticide product that is representative of a major formulation category (*e.g.*, emulsifiable concentrate, granular product, wettable powder) and pesticide group (*e.g.*, herbicide, fungicide, insecticide *etc.*) and contains the active ingredient of the applicant’s product.” (Holst and Ellwanger, 1982) Page 5 of these guidelines provides additional information on what TEP data should be tested for toxicity testing in the following excerpt:

“The Agency seeks to avoid imposing a burden of duplicative testing on applicants for registration. Therefore, where 40 CFR Part 158 specifies that the test substance should be a representative end-use product, testing may be performed using the formulation in question (end-use product being registered) or similar, yet representative, end-use product. It is not necessary to repeat the test using other similar products.” (Holst and Ellwanger, 1982)

When TEP data are requested, data should be submitted for the different formulation types, *e.g.*, wettable powder, emulsifiable concentrate, granular, along with a rationale as to why the TEP is representative of other similar end-use products.

14.3. Additional Information Needed on Specific Labels, Uses, and Formulation Types

Some of the labels do not contain enough information to estimate the exposure for particular uses without several assumptions. When such information is not provided, the Agency must rely on

standard assumptions. Such assumptions may be high-end, so that the Agency does not run the risk of underestimating risks. The information in question is discussed briefly below:

- EPA Registration Number WA110010

The label for EPA registration number WA110010 allows for control of apple maggots in non-agricultural quarantine and pest free areas (including residential areas) on apples, crabapples, pears, ornamental plants and trees, and non-bearing fruit and nut trees. The product is applied to give the tree uniform spray coverage of the plant. The label does not have a maximum single application rate. It does indicate that the product may be applied every 12 days, up to 4 times a year, with a maximum of 0.55 lbs ai/A/year.

- EPA Registration Number 8033-22

The label for EPA Registration Number 8033-22 does not have a maximum single application rate for any of the uses on ornamental and flowering plants grown outdoors and in greenhouses, shadehouses, and lathouses. Use instructions give a number of water soluble packets per gallons. The following use restrictions are provided:

- Do not make more than five applications per year
- Do not reapply more than once every seven days
- Do not apply more than 0.55 lbs ai per year

- EPA Registration Number 8033-21

EPA Registration Number 8033-21 is a liquid ready-to-use product that may be used on ornamentals, houseplants, vegetables, citrus fruits, and pome fruits. Neither a maximum single application rate nor a maximum number of applications per crop cycle or per year is provided on the label.

- EPA Registration Number 8033-108

EPA Registration Number 8033-108 is a product for homeowner use. Use sites include gardens and houseplants. No maximum single application rate, maximum number of applications, or maximum application rate per year or crop cycle are provided.

- EPA Registration Number 8033-107

EPA Registration Number 8033-107 is a homeowner product registered for use on gardens, vegetables, pome fruits, grapes and other climbing vine small fruit (except fuzzy kiwifruit), tuberous and corm vegetables, stone fruit, cucurbits, tree nuts, edible podded and legume vegetables, succulent shelled peas, beans, blueberries and other bush and cane berries, onions, bulb vegetables, and houseplants. No maximum single application rate, maximum number of applications, or maximum application rate per year or crop cycle are provided.

- Agricultural Uses

Many agricultural product labels do not specify maximum number of applications per crop cycle or year or maximum application rate per year or crop cycle. A few uses on transplants provide a use rate in lbs ai/plant. As a high number of plants may be planted, this results in a very high estimated application rate per acre. A maximum single application rate in lbs ai/A or maximum number of plants treated per acre is needed to estimate exposure. In the absence of this information, EFED will use estimates on the maximum number of plants that may be planted per acre to estimate a maximum single application rate for these uses.

- Uses on Trees

Labels of two products allow for use of tree injections or basal bark treatments (EPA Reg No. 8033-94 and 8033-106) on ornamental and non-bearing fruit and nut trees. The use parameters on the labels are not well-defined. Use rates for trees are provided only as recommendations on these labels. The maximum annual application rate is not specified for any of the uses for trees. No maximum single or annual rate is provided for bark treatment. Minimum application intervals and the maximum number of applications per year are not specified. In addition, applications to individual trees are also not well-defined; a maximum amount of acetamiprid that can be applied per diameter of the tree is needed to determine exposure and potential risks associated with applications to individual trees. Finally, it would also be helpful define a maximum amount of acetamiprid that can be applied to individual trees per acre or info on a maximum number of trees that could be treated per acre with various diameter at breast heights (DBH). It would also be useful to specify the types of sites for which the product is intended (*e.g.*, forest, tree production, residential, *etc.*).

- Termiticides, Ant Control, and Control of other Pests

For termiticide, ant control, and the control of other miscellaneous pests around buildings, structures, equipment, paths, wood products, *etc.*, a maximum single application rate per acre, maximum number of applications, and maximum application per year should also be provided on labels. For mound treatments, in the absence of additional information, EFED will use estimates on the maximum number of mounds per acre that may occur to estimate an application rate. For perimeter treatments, a maximum distance from the edge of the building that may be treated should be provided. In the absence if additional information provided on the labels, EFED will make conservative assumptions for these uses.

- Bait Treatments (Gels)

Some labels provide an application rate per spot. A maximum single application rate per acre or other unit area, maximum number of applications, and maximum application per year should be provided on labels. In the absence of this information, EFED will use estimates on the maximum number of mounds per acre that may occur in order to estimate an application rate.

- Seed Treatments

Acetamiprid may be used to treat mustard, canola, and potato seed pieces. For seed treatment uses, the following information is needed:

- Number of seeds (treated seeds, if encapsulated) per pound
- Number of treated seeds per acre or pound of treated seed per acre
- Amount of active ingredient per treated seed or cwt of seed
- Minimum planting depth
- Identify where the treatment is for commercial use only or commercial and "on farm" treatments can be made

- Uses on Cranberries

Acetamiprid may be used on cranberries. The use directions for cranberries are combined with use instructions for other berries that do not have a portion of the crop that is flooded. More information is needed on the labels describing use of acetamiprid on cranberries because cranberries are grown in cranberry bogs and may involve direct applications to water. For uses that may involve direct applications to water, it is recommended that the following information be included on the label so that exposure may be estimated.

- The maximum target concentration in water must be specified on the label (specify if there is a requirement to test the water body for stratification to calculate the application rate)
- Describe the period of time water must be held before it is released

- Granular Formulations

In order to assess the risk to terrestrial organisms exposed to baits or granules not in a container or bait station the weight of one granule or number of granules per unit weight for each granular formulation would be useful.

14.4. Other Information Needs

There is specific information that will assist the Agency in refining the ecological risk assessment, including any species-specific effects determinations. The Agency is very much interested in obtaining the following information:

- Confirmation on the following label information
 - Frequency of application, application intervals, and maximum number of applications per season
 - Geographic limitations on use
- Use or potential use distribution (*e.g.*, acreage and geographical distribution of relevant crops)
- Use history

- Median and 90th percentile reported use rates (lbs. ai/acre) from usage data – national, state, and county
- Application timing (date of first application and application intervals) by crop – national, state, and county
- Sub-county crop location data
- Directly acquired county-level usage data (not derived from state level data)
 - Maximum reported use rate (lbs. ai/acre) from usage data – county
 - Percent crop treated – county
 - Median and 90th percentile number of applications – county
 - Total pounds per year – county
 - The year the pesticide was last used in the county/sub-county area
 - The years in which the pesticide was applied in the county/sub-county area
- State or local use restrictions
- Ecological incidents (non-target plant damage and avian, fish, reptilian, amphibian and mammalian mortalities) not already reported to the Agency
- Monitoring data

15. References

15.1. Literature Cited

- AERU. 2012. The FOOTPRINT Pesticide Properties Database. Agriculture & Environment Research Unit (AERU). Available at <http://sitem.herts.ac.uk/aeru/footprint/> (Accessed August 8, 2012).
- Aliouane, Y., El Hassani, A. K., Gary, V., Armengaud, C., Lambin, M., & Gauthier, M. 2009. Subchronic exposure of honeybees to sublethal doses of pesticides: effects on behavior. *Environ Toxicol Chem*, 28(1), 113-122.
- Armitage, J. M., & Gobas, F. A. P. C. 2007. A terrestrial food-chain bioaccumulation model for POPs. *Environmental Science and Technology*, 41, 4019-4025.
- Atkins, E., Anderson, L., Kellum, D., & Neuman, K. 1976. Protecting Honey Bees From Pesticides. *Univ. California, Div. Agric. Sci., Leaflet 2883*.
- Beketov, M. A., & Liess, M. 2008. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. *Arch Environ Contam Toxicol*, 55, 247-253.
- Burns, L. A. 2000. *Exposure Analysis Modeling System (EXAMS): User Manual and System Documentation. Revision G*. EPA/600/R-00/81-023. September 2000. Ecosystems Research Division. National Exposure Research Laboratory. United States Environmental Protection Agency.

- Carsel, R. F., Imhoff, J. C., Hummel, P. R., Cheplick, J. M., & Donigian Jr., J. S. 1997. *PRZM-3, A Model for Predicting Pesticide and Nitrogen Fate in Crop Root and Unsaturated Soil Zones: Users Manual for Release 3.0*. Memorandum From to Environmental Research Laboratory. Office of Research and Development. United States Environmental Protection Agency.
- Echeverria, M., Jones, R. D., Peck, C., Ruhman, M., Shelby, A., Thawley, S., et al. 2012. *Development and Use of Percent Cropped Area and Percent Turf Area Adjustment Factors in Drinking Water Exposure Assessments: 2012 Update*. March 16, 2012. Environmental Fate and Effects Division. Office of Pesticide Programs. United States Environmental Protection Agency. Available at http://www.epa.gov/oppefed1/models/water/pca_adjustment_dwa.html (Accessed April 25, 2012).
- El Hassani, A. K., Dacher, M., Gary, V., Lambin, M., Gauthier, M., & Armengaud, C. 2008. Effects of sublethal doses of acetamiprid and thiamethoxam on the behavior of the honeybee (*Apis mellifera*). *Arch Environ Contam Toxicol*, 54(4), 653-661.
- Fletcher, J. S., Nellessen, J. E., & Pfleeger, T. G. 1994. Literature-Review and Evaluation of the Epa Food-Chain (Kenaga) Nomogram, an Instrument for Estimating Pesticide-Residues on Plants. *Environmental Toxicology and Chemistry*, 13(9), 1383-1391.
- Gobas, F. A. P. C., Kelly, B. C., & Arnot, J. A. 2003. Quantitative structure activity relationships for predicting the bioaccumulation of POPs in terrestrial food-webs. *QSAR Comb. Sci*, 22, 329-336.
- Hoerger, F., & Kenaga, E. E. 1972. Pesticide Residues on Plants: Correlation of Representative Data as a Basis for Estimation of their Magnitude in the Environment. In F. Coulston & F. Korte (Eds.), *Environmental Quality and Safety: Chemistry, Toxicology, and Technology* (Vol. 1, pp. 9-28). New York: Academic Press.
- Holst, R. W., & Ellwanger, T. C. 1982. *Pesticide Assessment Guidelines. Subdivision J. Hazard Evaluation: Nontarget Plants*. EPA-540/09-82-020. October 1982. Office of Pesticide Programs. Office of Pesticides and Toxic Substances. United States Environmental Protection Agency.
- Iwasa, T., Motoyama, N., Ambrose, J. T., & Roe, R. M. 2004. Mechanism for the differential toxicity of neonicotinoid insecticides in the honey bee, *Apis mellifera*. *Crop Protection*, 23(5), 371-378.
- Karlick, J. F., & McKay, A. H. 2002. *Leaf Area Index, Leaf Mass Density, and Allometric Relationships Derived From Harvest of Blue Oaks in a California Oak Savanna*. General

Technical Report PSW-GTR-184. USDA Forest Service.

- Laurino, D., Porporato, M., Patetta, A., & Manino, A. 2011. Toxicity of neonicotinoid insecticides to honey bees: laboratory tests. *Bulletin of Insectology*, 64(1), 107-113.
- Morrica, P., Fidente, P., & Seccia, S. 2005. Liquid chromatographic determination of nine N-methylcarbamates in drinking water. *Biomedical Chromatography*, 19(1), 107-110.
- Spray Drift Task Force Spray Software. AgDRIFT (Version 2.01). Available at http://www.agdrift.com/AgDRIFT2/DownloadAgDrift2_0.htm
- Sur, R., & Stork, A. 2003. Uptake, translocation and metabolism of imidacloprid in plants. *Bulletin of Insectology*, 56(1), 35-40.
- Teske, M. E., & Curbishley, T. B. 2003. *Continuum Dynamics, Inc. AGDISP Version 8.07 User Manual*. Prepared For United States Department of Agriculture Forest Service. C.D.I. Technical Note No. 02-06. June 2003.
- Tomizawa, M., & Casida, J. E. 2005. NEONICOTINOID INSECTICIDE TOXICOLOGY: Mechanisms of Selective Action. *Annual Review of Pharmacology and Toxicology*, 45(1), 247-268.
- USEPA. 1998. *Government Printing Office. Guidelines for Ecological Risk Assessment*. EPA/630/R-95/002F. United States Environmental Protection Agency (USEPA). Risk Assessment Forum. Office of Research and Development. Available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460> (Accessed June 19, 2009).
- USEPA. 1999. *Appendix VII. Addendum to the Drinking Water Memorandum to HED*. October 6, 1999. Environmental Fate and Effects Division. Office of Pesticide Programs. .
- USEPA. 2001. *Acetamiprid. Results of the HED Metabolism Assessment Review Committee*. D278652. Memorandum From H. Bietlot, M. Doherty & P. Hurley to Y. Donovan. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency.
- CFR. Part 2002. *Acetamiprid Pesticide Fact Sheet*. Government Printing Office. Washington, D.C.
- USEPA. 2002.D270368. *EFED's Section 3 Risk Assessment for Acetamiprid*. D270368. Memorandum From F. N. Mastrota & C. A. Sutton to A. Abramovitch. March 4, 2002. Environmental Fate and Effects Division. Office of Chemical Safety and Pollution

Prevention. United States Environmental Protection Agency.

USEPA. 2004.D304025. *Ecological Risk Assessment for Proposed Use of Acetamiprid on Potatoes, Tobacco, and Residential (Outdoor) Use Sites*. D304025. Memorandum From B. D. Kiernan & C. A. Sutton to A. Abramovitch. August 30, 2004. Environmental Fate and Effects Division. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency.

USEPA. 2004a. *Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs, United States Environmental Protection Agency (USEPA)* (pp. 100). Washington, D.C.: Government Printing Office. Available at <http://www.epa.gov/espp/consultation/ecorisk-overview.pdf> (Accessed June 19, 2009).

USEPA. 2004b. *Government Printing Office. Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs*. United States Environmental Protection Agency (USEPA). Environmental Fate and Effects Division. Office of Pesticide Programs. Available at <http://www.epa.gov/espp/consultation/ecorisk-overview.pdf> (Accessed June 19, 2009).

USEPA. 2005.D319610. *Acetamiprid New Use (Cucurbits, Stone Fruits, and Tree Nuts): Environmental Fate and Effects Risk Assessment*. D319610. Memorandum From B. D. Kiernan & G. Orrice to A. Abramovitch. July 27, 2005. Environmental Fate and Effects Division. Office of Chemical Safety and Pollution Prevention. United States Environmental Protection Agency.

USEPA. 2006. *User's Guide: TerrPlant version 1.2.2*. Memorandum From to Environmental Fate and Effects Division, Office of Pesticide Programs, Office of Chemical Safety and Pollution Prevention, United States Environmental Protection Agency. Available at http://www.epa.gov/oppefed1/models/terrestrial/terrplant/terrplant_user_guide.html (Accessed May 13, 2011).

USEPA. 2008a. *User's Guide: T-REX version 1.2.2*. Memorandum From to Environmental Fate and Effects Division, Office of Pesticide Programs, Office of Chemical Safety and Pollution Prevention, United States Environmental Protection Agency. Available at http://www.epa.gov/oppefed1/models/terrestrial/trex/t_rex_user_guide.htm (Accessed May 13, 2011).

USEPA. 2008b. *White paper on Methods for Assessing Ecological Risks of Pesticides with Persistent, Bioaccumulative, and Toxic Characteristics*. In Submitted to the FIFRA Scientific Advisory Panel for Review and Comment (Ed.), *October 7, 2008*. Washington, D.C. Available at http://www.epa.gov/scipoly/SAP/meetings/2008/october/sap_pbt_whitepaper_final_Oct

7_08d.pdf (Accessed January 27, 2010).

USEPA. 2009.D364328. *Ecological Risk Assessment for the Section 3 New Uses of Acetamiprid on Red Clover, Small Fruit, and Climbing Vines (Except Kiwi)*. D3643528. Memorandum From B. D. Kiernan & D. Lieu to J. Chao & J. Hebert. December 10, 2009. Environmental Fate and Effects Division. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency.

USEPA. 2009a. *ECOTOXicology Database, United States Environmental Protection Agency (USEPA)*. Available at <http://cfpub.epa.gov/ecotox/> (Accessed June 19, 2009).

USEPA. 2009b. Estimation Program Interface (EPI) Suite: United States Environmental Protection Agency. Available at <http://www.epa.gov/oppt/exposure/pubs/episuite.htm> (Accessed August 24, 2012).

USEPA. 2009c. *SAP Minutes No. 2009-01. A set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Selected Issues Associated with the Risk Assessment Process for Pesticides with Persistent, Bioaccumulative, and Toxic Characteristics. October 28-31, 2008., January 29, 2009.* Available at http://www.epa.gov/scipoly/sap/meetings/2008/102808_mtg.htm (Accessed July 9, 2009).

USEPA. 2010a. *Guidance for Reporting on the Environmental Fate and Transport of the Stressors of Concern in the Problem Formulation for Registration Review, Registration Review Risk Assessments, Listed Species Litigation Assessments, New Chemical Risk Assessments, and Other Relevant Risk Assessments, January 25, 2010.*

USEPA. 2010b. *Section 3 Product Registration For Expansion of Tree Species for Emamectin Benzoate Tree Injection Use to Control Arthropod Pests*. DP Barcode 381025. October 5, 2010. Environmental Fate and Effects Division. Office of Pesticide Programs. United States Environmental Protection Agency.

USEPA. 2011a. *Ecological Risk Assessment for the Proposed Section 3 New Use of Acetamiprid on a Variety of Agricultural Crops and as Bait Near Animal Areas and Enclosed Dumpsters*. In D. D389536, D394268, D394270 (Ed.), November 29, 2011.

USEPA. 2011.D394234, D394479. *Tier I Drinking Water Exposure Assessment for the Section 3 New Use of Acetamiprid on Various Agricultural Crops and as a Scatter Bait to Control Insects*. D394234 & D394479. October 11, 2011. Environmental Fate and Effects Division. Office of Pesticide Programs. United States Environmental Protection Agency.

USEPA. 2011b. *U.S EPA Water Models*. Memorandum From to Environmental Fate and Effects Division, Office of Pesticide Programs, Office of Chemical Safety and Pollution Prevention, United States Environmental Protection Agency. Available at <http://www.epa.gov/oppefed1/models/water/#przm> (Accessed May 13, 2011).

USEPA. 2012. *BEAD Chemical Profile for Registration Review: Acetamiprid*. Memorandum From D. Brassard, R. Prieto & M. Ranville to C. Britton. March 1, 2012. Biological and Economic Analysis Division. Office of Pesticide Programs. United States Environmental Protection Agency.

USFWS/NMFS. 1998. *Government Printing Office. Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. Final Draft*. United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). Available at <http://www.fws.gov/endangered/consultations/s7hndbk/s7hndbk.htm> (Accessed June 19, 2009).

USNLM. 2009. TOXNET Toxicology Data Network. United States National Library of Medicine (USNLM). Available at <http://toxnet.nlm.nih.gov/> (Accessed July 9, 2009).

15.2. Submitted Studies

Avian Single Dose Oral Toxicity

44651859 Johnson, A. (1994) NI-25: Acute Oral Toxicity (LD50) to the Mallard Duck: Lab Project Number: NPS 62/932516. Unpublished study prepared by Huntingdon Research Centre Ltd. 50 p.

48407701 Hubbard, P. (2011) Acetamiprid: An Acute Oral Toxicity Study with the Zebra Finch (*Taeniopygia guttata* aka *Poephila guttata*). Unpublished study performed by Wildlife International, Ltd., Easton, Maryland. Laboratory Project ID: 437-119. Study sponsored by Nippon Soda Co., Ltd., Chiyoda-ku, Tokyo, Japan.

Avian Dietary Toxicity

44651860 Johnson, A. (1994) NI-25: Subacute Dietary Toxicity (LC50) to the Bobwhite Quail: Lab Project Number: NPS 59/932525. Unpublished study prepared by Huntingdon Research Centre Ltd. 37 p.

44651861 Johnson, A. (1994) NI-25: Subacute Dietary Toxicity (LC50) to the Mallard Duck: Lab Project Number: NPS 60/942075. Unpublished study prepared by Huntingdon Research Centre Ltd. 40 p.

44651862 Brewer, L.; Taliaferro, M.; Miller, V. (1998) 5-Day Dietary Toxicity Test with IM-1-4 in the Mallard Duck (*Anas platyrhynchos*): Amended Final Report: Lab Project Number: 019803: EBA-019803. Unpublished study prepared by EBA, Inc. 166 p.

Avian Reproduction

44988407 Taliaferro, M.; Brewer, L.; Miller, V. (1999) Reproduction Study with Acetamiprid in the Northern Bobwhite (*Colinus virginianus*): Amended Final Report: Lab Project Number: 029604. Unpublished

study prepared by EBA, Inc. 319 p.

- 44988408 Taliaferro, M.; Miller, V. (1999) Reproduction Study with Acetamiprid in the Mallard Duck (*Anas platyrhynchos*): Final Report: Lab Project Number: 29708. Unpublished study prepared by EBA, Inc. 346 p.
- 46369201 Stafford, J. (2004) Acetamiprid (NI-25) - Reproductive Toxicity Test with Mallard Duck (*Anas platyrhynchos*). Project Number: 13798/4105. Unpublished study prepared by Springborn Smithers Laboratories. 153 p.

Acute Toxicity to Freshwater Fish

- 44651863 Suteau, P. (1997) Acetamiprid: Acute Toxicity (96 Hours) to Bluegill (*Lepomis macrochirus*) Under Flow-Through Conditions: Amended Report: Lab Project Number: SA 96120: R&D/CRSA/ANL/96-011. Unpublished study prepared by Rhone-Poulenc Agrochimie. 72 p.
- 44651864 Saika, O. (1996) NI-25--Acute Toxicity Study in Rainbow Trout: Lab Project Number: H088. Unpublished study prepared by Nippon Soda Co., Ltd. 23 p.
- 44651865 McElligott, A. (1998) IM-1-4: Acute Toxicity (96 Hours) to Rainbow Trout (*Oncorhynchus mykiss*) Under Semi-Static Conditions: Lab Project Number: SA 97231: R&D/CRSA/ANL/97-012. Unpublished study prepared by Rhone-Poulenc Agro. 82 p.

Acute Toxicity to Freshwater Invertebrates

- 44651866 Saika, O. (1997) NI-25: Acute Toxicity Study in Daphnids: Lab Project Number: H100. Unpublished study prepared by Nippon Soda Co., Inc. 22 p.
- 44651867 McElligott, A. (1997) IM-1-2: Acute Toxicity (48 Hours) to Daphnids (*Daphnia magna*) Under Semi-Static Conditions: Lab Project Number: SA 97046: R&D/CRSA/ANL/97-010. Unpublished study prepared by Rhone-Poulenc Agrochimie. 67 p.
- 44651868 McElligott, A. (1997) IM-1-4: Acute Toxicity (48 Hours) to Daphnids (*Daphnia magna*) Under Semi-Static Conditions: Lab Project Number: SA 97047: R&D/CRSA/ANL/97-012. Unpublished study prepared by Rhone-Poulenc Agrochimie. 67 p.
- 44988409 McElligott, A. (1997) IC-0: Acute Toxicity (48 Hours) to Daphnids (*Daphnia Magna*) Under Semi-Static Conditions: Lab Project Number: SA 97045: RND/CRSA/ANL/97-009. Unpublished study prepared by Rhone-Poulenc Agrochimie. 66 p. (OPPTS 830.1010)
- 45916201 Putt, A. (2003) Acetamiprid Technical--Acute Toxicity to Midge (*Chironomus riparius*) Under Static Conditions: Lab Project Number: 12681.6104: 012803/ASTM/MIDGE/NIPPON SODA. Unpublished study prepared by Springborn Smithers Laboratories. 50 p.
- 45932501 Putt, A. (2003) Acetamiprid Technical--Acute Toxicity to Gammarids (*Gammarus fasciatus*) Under Static Conditions: Lab Project Number: 12681.6105: 012803/ASTM/GAMMARIDS/NIPPON SODA. Unpublished study prepared by Springborn Smithers Laboratories. 50 p. (OPPTS 850.1020)

Acute Toxicity to Estuarine/Marine Organisms

- 44651869 Putt, A. (1998) Acetamiprid Technical--Acute Toxicity to Mysids (*Mysidopsis bahia*) Under Flow-Through Conditions: Final Report: Lab Project Number: 97-9-7100: 10566.0697.6424.515: 13529. Unpublished study prepared by Springborn Laboratories, Inc. 70 p.
- 44651870 Putt, A. (1998) IM-1-4--Acute Toxicity to Mysids (*Mysidopsis bahia*) Under Static Conditions: Final Report: Lab Project Number: 98-3-7276: 10566.0198.6468.510: 110797/FIFRA/515/RHONE-

POULENC. Unpublished study prepared by Springborn Laboratories, Inc. 74 p.

- 44988410 Dionne, E. (1999) Acetamiprid Technical--Acute Toxicity to the Eastern Oyster (*Crassostrea virginica*) Under Flow-Through Conditions: Final Report: Lab Project Number: 97-10-7105: 10566.0697.6426.504: 13528. Unpublished study prepared by Springborn Laboratories, Inc. 71 p.
- 44988411 Putt, A. (1998) Acetamiprid Technical--Acute Toxicity to Sheepshead Minnow (*Cyprinodon variegatus*) Under Flow-Through Conditions: Final Report: Lab Project Number: 97-10-7104: 10566.0697.6425.505: 13527. Unpublished study prepared by Springborn Laboratories, Inc. 69 p.

Fish Early Life Stage/Aquatic Invertebrate Life Cycle Study

- 44651871 Suteau, P. (1997) Acetamiprid: Daphnia Magna Life Cycle (21-Day Static Renewal) Chronic Toxicity Study: Lab Project Number: SA 96122: R&D/CRSA/ANL/96-011. Unpublished study prepared by Rhone-Poulenc Agrochimie. 80 p.
- 44651872 Odin-Feurtet, M. (1997) Acetamiprid: Early Life Stage Toxicity Test to Fathead Minnow (*Pimephales promelas*): Lab Project Number: SA 96123: R&D/CRSA/ANL/96-011. Unpublished study prepared by Rhone-Poulenc Agrochimie. 89 p.
- 44651873 Sousa, J. (1998) Acetamiprid Technical--Chronic Toxicity to Mysids (*Mysidopsis bahia*) Under Flow-Through Conditions: Final Report: Lab Project Number: 98-2-7230: 10566.0897.6447.530: 060396/FIFRA/530. Unpublished study prepared by Springborn Laboratories, Inc. 91 p.

Acute oral toxicity in rats

- 44651821 Douds, D. (1997) An Acute Oral Toxicity Study in Rats with EXP 0667A: Amended Final Report: Lab Project Number: 3147.237. Unpublished study prepared by Springborn Laboratories, Inc. 69 p.
- 44651827 Douds, D. (1998) An Acute Oral Toxicity Study in Rats with NI-25 Plus Carbaryl RTU: Final Report: Lab Project Number: 3147.251. Unpublished study prepared by Springborn Laboratories, Inc. 23 p.
- 44651833 Mochizuki, N.; Kanaguchi, Y. (1998) Acetamiprid--Acute Oral Toxicity Study in Rats: Lab Project Number: G-0820. Unpublished study prepared by Nippon Soda Co., Ltd. 52 p.
- 44651834 Wakefield, A. (1998) IM-1-4: Acute Oral Toxicity Study in Rats: Amended Final Report: Lab Project Number: 6840-103: 18981-0-800: 22209. Unpublished study prepared by Covance Laboratories Inc. 36 p.
- 44651835 Mochizuki, N.; Goto, K. (1997) IM-1-2: Acute Oral Toxicity Study in Rats: Lab Project Number: G963. Unpublished study prepared by Nippon Soda Co., Ltd. 28 p.
- 44988420 Mochizuki, N.; Goto, K. (1997) IC-0: Acute Oral Toxicity Study in Rats: Lab Project Number: G-0941: 3686. Unpublished study prepared by Nippon Soda Co., Ltd. 26 p.
- 44988421 Mochizuki, N.; Goto, K. (1997) IM-0: Acute Oral Toxicity Study in Rats: Lab Project Number: G-0887: 3662. Unpublished study prepared by Nippon Soda Co., Ltd. 45 p.
- 44988422 Mochizuki, N.; Goto, K. (1997) IM-2-1: Acute Oral Toxicity Study in Rats: Lab Project Number: G931: 3684: 3692. Unpublished study prepared by Nippon Soda Co., Ltd. 45 p.

Acute dermal toxicity in rabbits or rats

- 44651822 Douds, D. (1998) An Acute Dermal Toxicity Study in Rabbits with EXP 80667A: (Acetamiprid 70 WP): Final Report: Lab Project Number: 3147.238. Unpublished study prepared by Springborn Laboratories, Inc. 31 p.

- 44651828 Douds, D. (1998) An Acute Dermal Toxicity Study in Rabbits with NI-25 Plus Carbaryl RTU: Final Report: Lab Project Number: 3147.252. Unpublished study prepared by Springborn Laboratories, Inc. 30 p.
- 44651836 Mochizuki, N.; Fuji, Y. (1998) Acetamiprid: Acute Dermal Toxicity Study in Rats: Lab Project Number: G-0882. Unpublished study prepared by Nippon Soda Co., Ltd. 26 p.
- 44988423 Wakefield, A. (1998) IM-1-4: Acute Dermal Toxicity Study in Rats: Amended Final Report: Lab Project Number: 6840-104: 1891-0-810: 22209. Unpublished study prepared by Covance Laboratories, Inc. 39 p.

Acute inhalation toxicity in rats

- 44651823 Bennick, J. (1997) NI-25 70% WP (EXP 80667A) Acute Inhalation Toxicity Study in Rats: Final Report: Lab Project Number: 3606-97. Unpublished study prepared by Stillmeadow, Inc. 20 p.
- 44651829 Douds, D. (1998) An Acute Nose Only Inhalation Toxicity Study in Rats with NI-25 Plus Carbaryl RTU: Final Report: Lab Project Number: 3147.253. Unpublished study prepared by Springborn Laboratories, Inc. 43 p.
- 44651837 Jackson, G. (1997) Acetamiprid: Acute (Four-Hour) Inhalation Study in Rats: Lab Project Number: NOD 4/970598. Unpublished study prepared by Huntingdon Life Sciences Ltd. 40 p.

Primary eye irritation in rabbits

- 44651824 Douds, D. (1998) A Primary Eye Irritation Study in Rabbits with EXP 80667A (Acetamiprid 70WP): Final Report: Lab Project Number: 3147.239. Unpublished study prepared by Springborn Laboratories, Inc. 29 p.
- 44651830 Douds, D. (1998) A Primary Eye Irritation Study in Rabbits with NI-25 Plus Carbaryl RTU: Final Report: Lab Project Number: 3147.254. Unpublished study prepared by Springborn Laboratories, Inc. 28 p.
- 44651838 Mochizuki, N.; Goto, K. (1997) Acetamiprid--Primary Eye Irritation Study in Rabbits: Lab Project Number: G-0826: 1609. Unpublished study prepared by Nippon Soda Co., Ltd. 32 p.

Primary dermal irritation

- 44651825 Douds, D. (1997) A Primary Skin Irritation Study in Rabbits with EXP 80667A (Acetamiprid 70WP): Final Report: Lab Project Number: 3147.240. Unpublished study prepared by Springborn Laboratories, Inc. 29 p.
- 44651831 Douds, D. (1998) A Primary Skin Irritation Study in Rabbits with NI-25 Plus Carbaryl RTU: Amended Final Report: Lab Project Number: 3147.255. Unpublished study prepared by Springborn Laboratories, Inc. 29 p.
- 44651839 Mochizuki, N.; Goto, K. (1997) Acetamiprid--Primary Dermal Irritation Study in Rabbits: Lab Project Number: G-0827: 1605. Unpublished study prepared by Nippon Soda Co., Ltd. 27 p.

Dermal sensitization

- 44651826 Douds, D. (1997) A Dermal Sensitization Study in Guinea Pigs with EXP 80667A (Acetamiprid 70WP) Modified Buehler Design: Final Report: Lab Project Number: 3147.241. Unpublished study prepared by Springborn Laboratories, Inc. 44 p.
- 44651832 Douds, D. (1998) A Dermal Sensitization Study in Guinea Pigs With NI-25 Plus Carbaryl RTU

Modified Buehler Design: Final Report: Lab Project Number: 3147.256. Unpublished study prepared by Springborn Laboratories, Inc. 43 p.

- 44651840 Coleman, D. (1997) Acetamiprid: Skin Sensitisation in the Guinea Pig: Lab Project Number: NOD/088: NOD 088/973169/SS. Unpublished study prepared by Huntingdon Life Sciences Ltd. 28 p.

Acute neurotoxicity screen study in rats

- 44651841 Hughes, E. (1997) Acetamiprid: Dose Range Finding Neurotoxicity to Rats by Acute Oral Administration (including determination of time to peak effect): Lab Project Number: RNP 510/970145. Unpublished study prepared by Huntingdon Life Sciences Ltd. 49 p.
- 44651842 Hughes, E. (1997) Acetamiprid: Neurotoxicity to Rats by Acute Oral Administration: Lab Project Number: RNP/509: RNP 509/970851. Unpublished study prepared by Huntingdon Life Sciences Ltd. 252 p.
- 45130801 Cunny, H. (2000) Supplemental Statistical Analysis and Historical Background Data for the Report Titled: Acetamiprid--Neurotoxicity to Rats by Dietary Administration for 13 Weeks (Huntingdon Study RNP/511 and MRID 44651845): Lab Project Number: RNP/511. Unpublished study prepared by Huntingdon Life Sciences. 15 p.

Subchronic Oral Toxicity: 90-Day Study

- 44651843 Nukui, T.; Ikeyama, S. (1997) Acetamiprid--Thirteen-Week Dietary Subchronic Toxicity Study in Rats: Lab Project Number: G-0768: 0246. Unpublished study prepared by Nippon Soda Co., Ltd. 376 p.
- 44988424 Auletta, C. (1998) A Subchronic (3-Month) Oral Toxicity Study of NI-25 in the Dog via Dietary Administration: Final Report: Lab Project Number: 91-3727. Unpublished study prepared by Bio/Dynamics, Inc. 259 p. OPPTS 870.3150
- 44988425 Nukui, T.; Ikeyama, S. (1997) Acetamiprid*-Thirteen-Week Dietary Subchronic Toxicity Study in Mice: Lab Project Number: G-0769: 0249. Unpublished study prepared by Nippon Soda Co., Ltd. 341 p.
- 44988426 Ivett, J. (1999) 13-Week Dietary Subchronic Toxicity Study with IM-1-4 in Rats: Final Report: Lab Project Number: 6840-102. Unpublished study prepared by Covance Laboratories Inc. 353 p.
- 44988427 Nukui, T.; Ikeyama, S. (1997) IM-0--Thirteen-Week Dietary Subchronic Toxicity Study in Rats: Lab Project Number: G-0889: 0259. Unpublished study prepared by Nippon Soda Co., Ltd. 265 p.
- 45245306 Auletta, C. (1998) A 4-Week Oral Toxicity Study of NI-25 in the Dog via Dietary Administration (Acetamiprid Technical): Final Report. Unpublished study prepared by Bio-dynamics, Inc. 142 p.

21-day dermal-rabbit/rat

- 44651844 Trutter, J. (1997) 21-Day Dermal Toxicity Study in Rabbits with Acetamiprid: Final Report: Lab Project Number: 6224-236. Unpublished study prepared by Covance Laboratories Inc. 212 p.

Subchronic Neurotoxicity: 90-Day Study

- 44651845 Hughes, E. (1997) Acetamiprid: Neurotoxicity to Rats by Dietary Administration for 13 Weeks: Lab Project Number: RNP/511: RNP 511/971179. Unpublished study prepared by Huntingdon Life Sciences Ltd. 311 p.

Chronic Toxicity

- 44651846 Auletta, C. (1998) A Chronic (12-Month) Oral Toxicity Study of NI-25 in the Dog via Dietary Administration: Final Report: Lab Project Number: 92-3117. Unpublished study prepared by Pharmacol LSR, Inc. 475 p.
- 44988428 Goldenthal, E. (1999) 18-Month Dietary Oncogenicity Study in Mice: NI-25: Lab Project Number: 449-016. Unpublished study prepared by MPI Research, Inc. 1488 p. OPPTS 870.4200
- 44988429 Hatch, R. (1999) Two Year Dietary Toxicity and Oncogenicity Study in Rats: NI-25: Lab Project Number: 449-015. Unpublished study prepared by MPI Research, Inc. 2105 p. OPPTS 870.4200
- 45245304 Cunny, H. (2000) Supplemental Historical Background Data for the Acetamiprid Two-Year Study in Rats--MRID 44988429. Unpublished study prepared by Aventis CropScience. 62 p.
- 45245305 Cunny, H. (2000) Supplemental Historical Background Data for the Acetamiprid 18-Month Study in Mice--MRID 44988428. Unpublished study prepared by Aventis CropScience. 30 p.
- 45532301 Cunny, H.; Pallen, C.; Bouvier, G. (2001) Biological and Statistical Analysis of Mammary Gland Findings in the Chronic Rat Study on Acetamiprid. Unpublished study prepared by Aventis CropScience. 28 p.
- 45532302 Cunny, H. (2001) Supplemental Historical Control Data for the Chronic Rat Study on Acetamiprid. Unpublished study prepared by Aventis CropScience. 36 p.

Oncogenicity

- 44988428 Goldenthal, E. (1999) 18-Month Dietary Oncogenicity Study in Mice: NI-25: Lab Project Number: 449-016. Unpublished study prepared by MPI Research, Inc. 1488 p. OPPTS 870.4200
- 44988429 Hatch, R. (1999) Two Year Dietary Toxicity and Oncogenicity Study in Rats: NI-25: Lab Project Number: 449-015. Unpublished study prepared by MPI Research, Inc. 2105 p. OPPTS 870.4200
- 45245304 Cunny, H. (2000) Supplemental Historical Background Data for the Acetamiprid Two-Year Study in Rats--MRID 44988429. Unpublished study prepared by Aventis CropScience. 62 p.
- 45245305 Cunny, H. (2000) Supplemental Historical Background Data for the Acetamiprid 18-Month Study in Mice--MRID 44988428. Unpublished study prepared by Aventis CropScience. 30 p.
- 45532301 Cunny, H.; Pallen, C.; Bouvier, G. (2001) Biological and Statistical Analysis of Mammary Gland Findings in the Chronic Rat Study on Acetamiprid. Unpublished study prepared by Aventis CropScience. 28 p.
- 45532302 Cunny, H. (2001) Supplemental Historical Control Data for the Chronic Rat Study on Acetamiprid. Unpublished study prepared by Aventis CropScience. 36 p.

Teratogenicity -- 2 Species

- 44651847 Nukui, T.; Fujii, Y. (1997) Acetamiprid--Teratogenicity Study in Rats: Lab Project Number: G-0829: 7071. Unpublished study prepared by Nippon Soda Co., Ltd. 279 p.
- 44651848 Nukui, T.; Fujii, Y. (1997) Acetamiprid--Teratogenicity Study in Rabbits: Lab Project Number: Amended: G-0830: 7074. Unpublished study prepared by Nippon Soda Co., Ltd. 165 p.
- 45245302 Cunny, H. (2000) Litter-Based Incidence of Fetal Observations and Historical Control Data for the Study, Acetamiprid-Rat Teratology Study (Laboratory Project G-0829): EPA MRID 44651847: Lab Project Number: 958540. Unpublished study prepared by Nippon Soda Co., Ltd. 23 p.
- 45245303 Cunny, H. (2000) Litter-Based Incidence of Fetal Observations and Historical Control Data for the Study, Acetamiprid--Rat Teratology Study (Laboratory Project G-0830): EPA MRID 44651848.

Unpublished study prepared by Nippon Soda Co., Ltd. 23 p.

2-generation repro.-rat

- 44988430 Trutter, J. (1999) Two-Generation Reproduction Study with NI-25 in Rats (Reproduction and Fertility Effects): Final Report: Lab Project Number: 6840-108. Unpublished study prepared by Covance Laboratories, Inc. 1605 p. OPPTS 870.3800
- 45245301 Cunny, H. (2000) Mean Pup Weights Per Liter (Male and Females Combined) for the Study, Two-Generation Reproduction Study with NI-25 Rats (Acetamiprid Technical): EPA MRID 44988430. Unpublished study prepared by Covance Laboratories, Inc. 15 p.

Interaction with Gonadal DNA

- 44651849 Kanaguchi, Y. (1997) Acetamiprid--Reverse Mutation Study on Bacteria: Lab Project Number: G-0831: 9816. Unpublished study prepared by Nippon Soda Co., Ltd. 29 p.
- 44651850 Mochizuki, N.; Kanaguchi, Y. (1997) IM-1-2--Reverse Mutation Study on Bacteria: Lab Project Number: G-964: G964. Unpublished study prepared by Nippon Soda Co., Ltd. 25 p.
- 44651851 Mochizuki, N.; Kanaguchi, Y. (1997) IM-1-4--Reverse Mutation Study on Bacteria: Lab Project Number: G-940: G940. Unpublished study prepared by Nippon Soda Co., Ltd. 25 p.
- 44651852 Murli, H. (1998) Mutagenicity Test on NI-25 in an in vivo Mouse Micronucleus Assay: Second Amended Second Revised Final Report: Lab Project Number: 15901-0-455: 20996: 455. Unpublished study prepared by Hazleton Washington, Inc. 32 p.
- 44651853 San, R.; Sly, J. (1997) Unscheduled DNA Synthesis (UDS) Test with Mammalian Liver Cells in vivo: Acetamiprid: Amended Final Report: Lab Project Number: G97AG26.381. Unpublished study prepared by Microbiological Associates, Inc. 69 p.
- 44651854 Durward, R. (1998) NI-25: Metaphase Analysis in the Rat Bone Marrow in vivo: Lab Project Number: 235/017R2. Unpublished study prepared by Safepharm Laboratories Limited. 32 p.
- 44651855 Kanaguchi, Y. (1997) Acetamiprid--Chromosomal Aberration Study in Chinese Hamster Ovary (CHO) Cells: Lab Project Number: G-0800: 9728. Unpublished study prepared by Nippon Soda Company, Ltd. 29 p.
- 44651856 Ham, A. (1998) Genotoxicity Test on NI-25 in the Assay for Unscheduled DNA Synthesis in Rat Liver Primary Cell Cultures with A Confirmatory Assay: Second Amended Third Revised Final Report: Lab Project Number: 15901-0-447R: 20991: 447R. Unpublished study prepared by Hazleton Washington, Inc. 41 p.
- 44651857 Adams, K. (1998) Acetamiprid: Mammalian Cell Mutation Assay: Lab Project Number: NOD 006/971139. Unpublished study prepared by Huntingdon Life Sciences Ltd. 27 p.
- 44988431 Cifone, M. (1998) Mutagenicity Test on IM-1-4 in the CHO/HGPRT Forward Mutation Assay: Final Report: Lab Project Number: 6840-106: 18981-0-435. Unpublished study prepared by Covance Laboratories, Inc. 52 p.
- 44988432 Mochizuki, N.; Kanaguchi, Y. (1997) IM-0--Reverse Mutation Study on Bacteria: Lab Project Number: G-949: 9862. Unpublished study prepared by Nippon Soda Co., Ltd. 25 p.
- 44988433 Mochizuki, N.; Kanaguchi, Y. (1997) IM-2-1--Reverse Mutation Study on Bacteria: Lab Project Number: G-932: 9851. Unpublished study prepared by Nippon Soda Co., Ltd. 25 p.
- 44988501 Curry, P. (1998) Mutagenicity Test on IM-1-4 in the In Vivo Mouse Micronucleus Assay: Final Report: Lab Project Number: 18981-0-455OECD. Unpublished study prepared by Covance Labs., Inc. 58 p.

- 44988502 Mochizuki, N.; Kanaguchi, Y. (1994) IC-0--Reverse Mutation Study on Bacteria: Lab Project Number: G-942: 9854. Unpublished study prepared by Nippon Soda Co., Ltd. 25 p.

General metabolism

- 44651858 Cheng, T. (1997) Dermal Absorption of (carbon 14) NI-25 in Male Rats (Preliminary and Definitive Phases): Final Report: Lab Project Number: COVANCE 6224-237: MC-5577. Unpublished study prepared by Covance Laboratories Inc. 160 p.
- 44988503 Mori, H.; Tanoue, T. (1997) (Carbon-14)-NI-25--Metabolism Study in Rats: (A Summary Report): Lab Project Number: EC-912. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 47 p.
- 44988504 Mori, H.; Tanoue, T. (1997) (Carbon-14)-NI-25--Metabolism Study in Rats: (Qualitative and Quantitative Analysis of Metabolites in Group C): Amended Final Report: Lab Project Number: 95-108: EC-842-1. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 81 p.
- 44988505 Mori, H.; Tanoue, T. (1997) (Carbon-14)-NI-25--Metabolism Study in Rats: Lab Project Number: EC-724: 2-94. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 661 p.
- 44988506 Premkumar, N.; Guo, C.; Vengurlekar, S. (1995) Adsorption, Distribution, Metabolism, Elimination, and Pharmacokinetics After Chronic Dosing of (carbon-14)-NI-25 in Rats: Lab Project Number: 42207. Unpublished study prepared by ABC Labs., Inc. 221 p.
- 44988507 Premkumar, N.; Guo, C. (1995) (Carbon-14)-NI-25--Biliary Excretion in Rat: Final Report: Lab Project Number: 42206. Unpublished study prepared by ABC Labs., Inc. 96 p.

Seed Germination/Seedling Emergence and Vegetable Vigor

- 44988413 Teixeira, D. (1999) Acetamiprid--Determination of Effects on Seedling Emergence and Vegetative Vigor of Ten Plant Species: Final Report: Lab Project Number: 97-12-7184: 10566.0397.6416.610. Unpublished study prepared by Springborn Laboratories, Inc. 265 p.
- 45921401 Teixeira, D. (2003) Acetamiprid--Determination of Effects on Vegetative Vigor of Lettuce (*Lactuca sativa*): Lab Project Number: 12681.6107. Unpublished study prepared by Springborn Smithers Laboratories. 73 p. OPPTS 850.4150 and 850.4250

Aquatic plant growth

- 44988414 Hoberg, J. (1997) Acetamiprid Technical--Toxicity to the Freshwater Green Alga *Selenastrum capricornutum*: Final Report: Lab Project Number: 97-5-6987: 10566.0297.6410.430. Unpublished study prepared by Springborn Laboratories, Inc. 57 p.
- 44988415 Hoberg, J. (1997) Acetamiprid Technical--Toxicity to Duckweed, *Lemna gibba*: Final Report: Lab Project Number: 97-7-7029: 10566.0397.6415.410. Unpublished study prepared by Springborn Laboratories, Inc. 63 p.
- 44988416 Hoberg, J. (1997) Acetamiprid Technical--Toxicity to the Fresh Water Blue-Green Alga, *Anabaena flos-aquae*: Final Report: Lab Project Number: 97-6-7008: 10566.0397.6414.420. Unpublished study prepared by Springborn Laboratories, Inc. 57 p.
- 44988417 Hoberg, J. (1997) Acetamiprid Technical--Toxicity to the Freshwater Diatom *Navicula pelliculosa*: Final Report: Lab Project Number: 97-6-7005: 10566.0397.6412.440. Unpublished study prepared by Springborn Laboratories, Inc. 58 p.
- 44988418 Hoberg, J. (1997) Acetamiprid Technical--Toxicity to the Marine Diatom *Skeletonema costatum*: Final

Report: Lab Project Number: 97-6-7028: 10566.0397.6413.450. Unpublished study prepared by Springborn Laboratories, Inc. 57 p.

Seed germination/seedling emergence and vegetative vigor

- 44988413 Teixeira, D. (1999) Acetamiprid--Determination of Effects on Seedling Emergence and Vegetative Vigor of Ten Plant Species: Final Report: Lab Project Number: 97-12-7184: 10566.0397.6416.610. Unpublished study prepared by Springborn Laboratories, Inc. 265 p.
- 45921401 Teixeira, D. (2003) Acetamiprid--Determination of Effects on Vegetative Vigor of Lettuce (*Lactuca sativa*): Lab Project Number: 12681.6107. Unpublished study prepared by Springborn Smithers Laboratories. 73 p. OPPTS 850.4150 and 850.4250

Dissipation of Dislodgeable Foliar & Soil Residues

- 45323001 Willard, T. (2001) Acetamiprid: Dissipation of Dislodgeable Residue on Cotton: Final Study Report: Lab Project Number: 97512640. Unpublished study prepared by Aventis CropScience. 371 p. OPPTS 875.2100

Honey bee acute contact

- 44651874 Candolfi, M. (1997) NI-25 (Acetamiprid): Laboratory Oral and Contact Toxicity Test with the Honeybee, *Apis mellifera*: Lab Project Number: 96-045-1013: 1013.018.265: 3.5.96/BEE NI-25. Unpublished study prepared by Springborn Laboratories (Europe) AG. 50 p.
- 45932503 Kling, A. (2003) Acute Contact and Oral Toxicity of EXP 60707A to the Bumble-Bee *Bombus terrestris* L. Under Laboratory Conditions: (Final Report): Lab Project Number: 20021073/02-BLEU: EXP 60707 A. Unpublished study prepared by GAB Biotechnologie GmbH. 33 p.

Honey bee residue on foliage

- 44651875 Collins, M. (1998) Evaluation of Toxicity of Residues of Acetamiprid (NI-25) on Alfalfa to Honey Bees (*Apis mellifera*): Final Report: Lab Project Number: 98-1-7214: 10566.0897.6449.266: 1412-97-004-09-21F-01. Unpublished study prepared by Landis International, Inc. and Springborn Laboratories, Inc. 80 p.
- 45346901 Hoberg, J. (2001) Evaluation of Toxicity of Residues of Acetamiprid (NI-25) and Procure 50WS on Alfalfa to Honey Bees (*Apis mellifera*): Lab Project Number: 13726.6123: 041100. Unpublished study prepared by Springborn Labs., Inc. 40 p. OPPTS 850.3030
- 45932502 Saika, O. (2003) Acetamiprid: Toxicity of Foliar Residue to Honey Bees: Lab Project Number: RD-03115. Unpublished study prepared by Nippon Soda Co., Ltd. 14 p.

Field test for pollinators

- 45932504 Schur, A. (2002) A Semi-Field Study on the Effects on Honey Bees (*Apis mellifera* L.) of Assail 70 WP (EXP61842A, Acetamiprid 70%) Straight and in Combination with the Fungicide Procure 50WS (Triflumizole 50%): (Final Report): Lab Project Number: 20011239/S1-BZEU: EXP61842A. Unpublished study prepared by GAB Biotechnologie GmbH. 54 p.
- 45932505 Schur, A. (2003) A Semi-Field Study on the Effects of a Foliar Application of EXP60707 A (Acetamiprid 20% SP) on the Brood Development of the Honey Bee (*Apis mellifera* L.): (Final Report): Lab Project Number: 20011073/01-BZEU: EXP60707A. Unpublished study prepared by GAB Biotechnologie GmbH. 88 p.

Fish early-life stage toxicity test

- 46729101 Saika, O. (2005) Response to Data Evaluation Report on the Toxicity of Acetamiprid (NI-25) to Fathead Minnow (*Pimephales promelas*), Fish Early Life Cycle (MRID 44651872). Project Number: NAI/06/002, SA/96123. Unpublished study prepared by Nippon Soda Co., Ltd. 83 p.

Avian acute oral toxicity test

- 48407701 Hubbard, P. (2011) Acetamiprid: An Acute Oral Toxicity Study with the Zebra Finch (*Poephila guttata*). Project Number: 437/119. Unpublished study prepared by Wildlife International, Ltd. 76 p.

Avian reproduction test

- 46014801 Brewer, L.; Bowers, L. (2003) Reply to EPA Data Evaluation Record (DER) for a Northern Bobwhite Reproduction Study with Acetamiprid. Project Number: NAI/03/001. Unpublished study prepared by Springborn Smithers Laboratories.
- 46369201 Stafford, J. (2004) Acetamiprid (NI-25) - Reproductive Toxicity Test with Mallard Duck (*Anas platyrhynchos*). Project Number: 13798/4105. Unpublished study prepared by Springborn Smithers Laboratories. 153 p.
- 46555601 Temple, D.; Martin, K.; Beavers, J.; et. al. (2005) Acetamiprid: A Reproductive Study with the Northern Bobwhite. Project Number: 437/104. Unpublished study prepared by Wildlife International, Ltd. 186 p.
- 46717701 Brewer, L. (2005) Response to EPA DER for Acetamiprid (NI-25) - Reproductive Toxicity Test with Mallard Duck (*Anas platyrhynchos*). Project Number: NAI/05/001. Unpublished study prepared by Springborn Smithers Laboratories. 17 p.

Honey bee toxicity of residues on foliage

- 47737801 Walsh, D. (2009) Pollinator Pesticide Safety Trials 2007: Flonicamid. Project Number: IB/2009/PH/002/01. Unpublished study prepared by Washington State University. 19 p.

Acute oral toxicity

- 46271906 Li, K. (2004) Acetamiprid (F5025) Ant & Roach Baits: Acute Oral Toxicity (in Rats) Studies and Waiver Request for Acute Dermal and Inhalation Toxicity, Eye and Skin Irritation and Skin Sensitization Studies. Project Number: P/3680, 3223/30, A2003/5722. Unpublished study prepared by FMC Corp Agricultural Products Group and Charles River Laboratories, Inc. 109 p.
- 46342702 Allen, D. (1997) NI-25 WSG: Acute Oral Toxicity Test in the Rat. Project Number: 235/148. Unpublished study prepared by Safepharm Laboratories, Ltd. 32 p.
- 46432802 Cerven, D. (2004) F4688: Acute Oral Toxicity (In Rats) - Up and Down Procedure (UDP). Project Number: A2004/5837, 1010/01, MB/04/12712/01. Unpublished study prepared by MB Research Laboratories. 24 p.
- 46685502 Patterson, D. (2001) An Acute Oral Toxicity Study in Rats with Acetamiprid 50 SF (EXP 81141A). Project Number: 3522/19. Unpublished study prepared by Springborn Laboratories, Inc. (SLI). 65 p.
- 46794304 Rodabaugh, D. (2006) An Acute Oral Toxicity Study in Rats with Acetamiprid 0.075% Ant Bait (Up/Down Study Design). Project Number: KZH00078, 000TSC05512, A2005/5953. Unpublished study prepared by Charles River Laboratories, Inc. 45 p.
- 46794306 Nuber, D. (2006) Acetamiprid Gel Baits (0.35% and 0.075%) Waiver Request for Acute Inhalation Toxicity. Project Number: P/3813. Unpublished study prepared by FMC Corp. 18 p.

- 46860202 Oshio, I. (2005) Acute Oral Toxicity Study of Acetamiprid 9.25 SL in Rats. Project Number: H262. Unpublished study prepared by Nippon Soda Co., Ltd. 24 p.
- 46860203 Takaori, H. (2006) Acute Oral Toxicity Study of Acetamiprid 9.25 SL in Rats - Second Study. Project Number: H285. Unpublished study prepared by Nippon Soda Co., Ltd. 20 p.
- 47838505 Griffon, B. (2001) Acetamiprid CEL 26521 SL: Acute Oral Toxicity in Rats. Project Number: 22016/TAR, 22016/TAR/CEL/265/21/SL/SCOTTS/France/SAS. Unpublished study prepared by Centre International de Toxicologie. 24 p.
- 47848104 Griffon, B. (2003) UKSO48A: Acute Oral Toxicity in Rats: "Acute Toxicity Class Method". Project Number: 25496/TAR. Unpublished study prepared by Centre International de Toxicologie. 27 p.
- 47868802 Rodabaugh, D. (2009) An Acute Oral Toxicity Study in Rats with EQEF 303 F5688 Insecticide (Up/Down Study Design). Project Number: KZH00123, A2006/6091. Unpublished study prepared by Charles River Laboratories, Inc. 55 p.
- 48327303 Wrubel, J. (2010) F7180-8 Fly Sticker Insecticide: Request for Bridging of Acute Toxicity Data Requirements. Project Number: NAI/10/004. Unpublished study prepared by Nisso America, Inc. 5 p.
- 48404404 Durando, J. (2011) GWN-9857: Acute Oral Toxicity Up and Down Procedure in Rats. Project Number: 29853, P320/UDP. Unpublished study prepared by Eurofins/Product Safety Laboratories. 20 p.
- 48463104 Durando, J. (2011) RF2157 Bait: Acute Oral Toxicity Up and Down Procedure in Rats. Project Number: 30975, P320/UDP/WEL. Unpublished study prepared by Eurofins/Product Safety Laboratories. 16 p.
- 48584601 Wolf, T. (2011) "AMP 44 RB": Acute Oral Toxicity Study with Rats (Up-and-Down Procedure). Project Number: KW173. Unpublished study prepared by Seibersdorf Labor GmbH. 31p.

Acute dermal toxicity

- 46342703 Allen, D. (1997) NI-25 WSG: Acute Dermal Toxicity (Limit Test) in the Rat. Project Number: 235/150. Unpublished study prepared by Safepharm Laboratories, Ltd. 18 p.
- 46432803 Gilotti, A. (2004) F4688: Acute Dermal Toxicity/LD50 in Rabbits. Project Number: A2004/5838, MB/04/12712/02, 1100/02. Unpublished study prepared by MB Research Laboratories. 25 p.
- 46685503 Patterson, D. (2001) An Acute Dermal Toxicity Study in Rabbits with Acetamiprid 50 SF (EXP81141A). Project Number: 3522/20. Unpublished study prepared by Springborn Laboratories, Inc. (SLI). 29 p.
- 46794305 Rodabaugh, D. (2006) An Acute Dermal Toxicity Study in Rats with Acetamiprid 0.075% Ant Bait. Project Number: KZH00079, A2005/5952, 000TSC05512. Unpublished study prepared by Charles River Laboratories, Inc. 53 p.
- 46794306 Nuber, D. (2006) Acetamiprid Gel Baits (0.35% and 0.075%) Waiver Request for Acute Inhalation Toxicity. Project Number: P/3813. Unpublished study prepared by FMC Corp. 18 p.
- 46860204 Sanders, A. (2006) Acetamiprid 9.25 SL: Acute Dermal Toxicity (Limit Test) in the Rat. Project Number: 235/494R. Unpublished study prepared by Safepharm Laboratories Ltd. 19 p.
- 47838506 Griffon, B. (2001) CEL 26521 SL: Acute Dermal Toxicity in Rats. Project Number: 22017/TAR, 22017/TAR/CEL/265/21/SL/SCOTTS/France/SAS. Unpublished study prepared by Centre International de Toxicologie. 26 p.
- 47848105 Griffon, B. (2003) UKSO48A: Acute Dermal Toxicity in Rats. Project Number: 25497/TAR. Unpublished study prepared by Centre International de Toxicologie. 27 p.
- 47868803 Rodabaugh, D. (2009) An Acute Dermal Toxicity Study in Rats with EQEF 303 F5688 Insecticide.

Project Number: KZH00133, A2006/6093. Unpublished study prepared by Charles River Laboratories, Inc. 56 p.

- 48327303 Wrubel, J. (2010) F7180-8 Fly Sticker Insecticide: Request for Bridging of Acute Toxicity Data Requirements. Project Number: NAI/10/004. Unpublished study prepared by Nisso America, Inc. 5 p.
- 48404405 Durando, J. (2010) GWN-9857: Acute Dermal Toxicity Study in Rats: Limit Test. Project Number: 29854, P322/RAT. Unpublished study prepared by Eurofins/Product Safety Laboratories. 15 p.
- 48463105 Durando, J. (2011) RF2157 Bait: Acute Dermal Toxicity Study in Rats. Project Number: P322/RAT/WEL, 30976. Unpublished study prepared by Eurofins/Product Safety Laboratories. 15 p.

Acute inhalation toxicity

- 46432804 Gilotti, A. (2004) F4688: Acute Inhalation Toxicity/LC50 in Rats. Project Number: A2004/5840, 1300/02, MB/04/12712/05. Unpublished study prepared by MB Research Laboratories. 35 p.
- 46685504 Patterson, D. (2001) An Acute Nose-Only Inhalation Toxicity Study in Rats with Acetamiprid 50 SF (EXP 81141A). Project Number: 3522/24. Unpublished study prepared by Springborn Laboratories, Inc. (SLI). 53 p.
- 46794306 Nuber, D. (2006) Acetamiprid Gel Baits (0.35% and 0.075%) Waiver Request for Acute Inhalation Toxicity. Project Number: P/3813. Unpublished study prepared by FMC Corp. 18 p.
- 46860205 Griffiths, D. (2005) Acetamiprid 9.25 SL: Acute Inhalation Toxicity (Nose Only) Study in the Rat. Project Number: 235/492R. Unpublished study prepared by Safepharm Laboratories Ltd. 37 p.
- 47838507 Restum, J. (2009) Acetamiprid Concentrate Insecticide Waiver Request from Further Testing: Acute Inhalation Toxicity LC50. Project Number: NAI/09/004. Unpublished study prepared by The Scotts Company. 6 p.
- 47848106 Restum, J. (2009) Acetamiprid + Trifluoromethyl Benzimidazole Concentrate Insecticide and Fungicide: Waiver Request from Further Testing: Acute Inhalation Toxicity LC50. Project Number: NAI/09/003. Unpublished study prepared by The Scotts Company. 6 p.
- 47868804 Rodabaugh, D. (2006) An Acute Nose-Only Inhalation Study in Rats with EQEF 303 F5688. Project Number: KZH00136, A2006/6092. Unpublished study prepared by Charles River Laboratories, Inc. 71 p.
- 48327303 Wrubel, J. (2010) F7180-8 Fly Sticker Insecticide: Request for Bridging of Acute Toxicity Data Requirements. Project Number: NAI/10/004. Unpublished study prepared by Nisso America, Inc. 5 p.
- 48404406 Durando, J. (2010) GWN-9857: Acute Inhalation Toxicity Study in Rats. Project Number: 29855, P330. Unpublished study prepared by Eurofins/Product Safety Laboratories. 24 p.
- 48463106 Mizens, M. (2011) RF2157 Bait: Request for Waiver of Tier 1 Pesticide Data Requirements. Project Number: 3948. Unpublished study prepared by Wellmark International. 16 p.

Acute eye irritation

- 46342704 Allen, D. (1997) NI-25 WSG: Primary Eye Irritation Test in the Rabbit. Project Number: 235/152. Unpublished study prepared by Safepharm Laboratories, Ltd. 22 p.
- 46432805 Hoff, T. (2004) F4688: Acute Eye Irritation in Rabbits. Project Number: A2004/5806, MB/04/12623/04, 1200/02. Unpublished study prepared by MB Research Laboratories. 20 p.
- 46685505 Patterson, D. (2001) A Primary Eye Irritation Study in Rabbits with Acetamiprid 50 SF (EXP 81141A). Project Number: 3522/21. Unpublished study prepared by Springborn Laboratories, Inc. (SLI). 29 p.

- 46794306 Nuber, D. (2006) Acetamiprid Gel Baits (0.35% and 0.075%) Waiver Request for Acute Inhalation Toxicity. Project Number: P/3813. Unpublished study prepared by FMC Corp. 18 p.
- 46794307 Rodabaugh, D. (2006) A Primary Eye Irritation Study in Rabbits with Acetamiprid 0.075% Ant Bait. Project Number: KZH00080, A2005/5954. Unpublished study prepared by Charles River Laboratories, Inc. 45 p.
- 46860206 Oshio, I. (2005) Acute Eye Irritation/Corrosion Study of Acetamiprid 9.25 SL in Rabbits. Project Number: H263. Unpublished study prepared by Nippon Soda Co., Ltd. 20 p.
- 47838508 Griffon, B. (2001) CEL 26521 SL: Acute Eye Irritation in Rabbits. Project Number: 22019/TAL, 22019/TAL/CEL/265/21/SL/SCOTTS/France/SAS. Unpublished study prepared by Centre International de Toxicologie. 20 p.
- 47848107 Griffon, B. (2003) UKSO48A: Acute Eye Irritation in Rabbits. Project Number: 25499/TAL. Unpublished study prepared by Centre International de Toxicologie. 28 p.
- 47868805 Rodabaugh, D. (2006) A Primary Eye Irritation Study in Rabbits with EQEF 303 F5688 Insecticide. Project Number: KZH00124, A2006/6089. Unpublished study prepared by Charles River Laboratories, Inc. 47 p.
- 48327303 Wrubel, J. (2010) F7180-8 Fly Sticker Insecticide: Request for Bridging of Acute Toxicity Data Requirements. Project Number: NAI/10/004. Unpublished study prepared by Nisso America, Inc. 5 p.
- 48404407 Durando, J. (2010) GWN-9857: Primary Eye Irritation Study in Rabbits. Project Number: 29856, P324. Unpublished study prepared by Eurofins/Product Safety Laboratories. 17 p.
- 48463106 Mizens, M. (2011) RF2157 Bait: Request for Waiver of Tier 1 Pesticide Data Requirements. Project Number: 3948. Unpublished study prepared by Wellmark International. 16 p.
- 48463107 Durando, J. (2011) RF2157 Bait: Primary Eye Irritation Study in Rabbits. Project Number: P324/WEL, 30977. Unpublished study prepared by Eurofins/Product Safety Laboratories. 11 p.

Acute dermal irritation

- 46342705 Allen, D. (1997) NI-25 WSG: Primary Dermal Irritation Test in the Rabbit. Project Number: 235/151. Unpublished study prepared by Safepharm Laboratories, Ltd. 13 p.
- 46432806 Hoff, T. (2004) F4688: Acute Dermal Irritation in Rabbits. Project Number: A2004/5839, 1130/02, MB/04/12712/03. Unpublished study prepared by MB Research Laboratories. 22 p.
- 46685506 Patterson, D. (2001) A Primary Skin Irritation Study in Rabbits with Acetamiprid 50 SF (EXP 81141A). Project Number: 3522/22. Unpublished study prepared by Springborn Laboratories, Inc. (SLI). 28 p.
- 46794306 Nuber, D. (2006) Acetamiprid Gel Baits (0.35% and 0.075%) Waiver Request for Acute Inhalation Toxicity. Project Number: P/3813. Unpublished study prepared by FMC Corp. 18 p.
- 46794308 Rodabaugh, D. (2006) A Primary Skin Irritation Study in Rabbits with Acetamiprid 0.075% Ant Bait. Project Number: KZH00081, A2005/5955. Unpublished study prepared by Charles River Laboratories, Inc. 45 p.
- 46860207 Sanders, A. (2006) Acetamiprid 9.25 SL: Acute Dermal Irritation in the Rabbit. Project Number: 235/495R. Unpublished study prepared by Safepharm Laboratories Ltd. 15 p.
- 47838509 Griffon, B. (2001) CEL 26521 SL: Acute Dermal Irritation in Rabbits. Project Number: 22018/TAL, 22018/TAL/CEL/265/21/SL/SCOTTS/France/SAS. Unpublished study prepared by Centre International de Toxicologie. 32 p.

- 47848108 Griffin, B. (2003) UKSO48A: Acute Dermal Irritation in Rabbits. Project Number: 25498/TAL. Unpublished study prepared by Centre International de Toxicologie. 22 p.
- 47868806 Rodabaugh, D. (2006) A Primary Skin Irritation Study in Rabbits with EQEF 303 F5688 Insecticide. Project Number: KZH00134, A2006/6090. Unpublished study prepared by Charles River Laboratories, Inc. 45 p.
- 48327303 Wrubel, J. (2010) F7180-8 Fly Sticker Insecticide: Request for Bridging of Acute Toxicity Data Requirements. Project Number: NAI/10/004. Unpublished study prepared by Nisso America, Inc. 5 p.
- 48404408 Durando, J. (2010) GWN-9857: Primary Skin Irritation Study in Rabbits. Project Number: 29857, P326. Unpublished study prepared by Eurofins/Product Safety Laboratories. 16 p.
- 48463108 Durando, J. (2011) RF2157 Bait: Primary Skin Irritation Study in Rabbits. Project Number: P326/WEL, 30978. Unpublished study prepared by Eurofins/Product Safety Laboratories. 16 p.

Skin sensitization

- 46342706 Allen, D. (1997) NI-25 WSG: Buehler Delayed Contact Hypersensitivity Study in the Guinea Pig. Project Number: 235/153. Unpublished study prepared by Safepharm Laboratories, Ltd. 36 p.
- 46432807 Hall, D. (2004) F4688: Delayed Contact Dermal Sensitization Test - Buehler Method. Project Number: A2004/5841, MB/04/12712/06, 1160/02. Unpublished study prepared by MB Research Laboratories. 54 p.
- 46685507 Patterson, D. (2001) A Dermal Sensitization Study in Guinea Pigs with Acetamiprid 50 SF (EXP 81141A) - Modified Buehler Design. Project Number: 3522/23, 999/150. Unpublished study prepared by Springborn Laboratories, Inc. (SLI). 46 p.
- 46794306 Nuber, D. (2006) Acetamiprid Gel Baits (0.35% and 0.075%) Waiver Request for Acute Inhalation Toxicity. Project Number: P/3813. Unpublished study prepared by FMC Corp. 18 p.
- 46794309 Rodabaugh, D. (2006) A Dermal Sensitization Study in Guinea Pigs With Acetamiprid 0.075% Ant Bait Modified Buehler Design. Project Number: KZH00082, A2005/5956. Unpublished study prepared by Charles River Laboratories, Inc. 65 p.
- 46860208 Sanders, A. (2006) Acetamiprid 9.25 SL: Local Lymph Node Assay in the Mouse. Project Number: 235/496R. Unpublished study prepared by Safepharm Laboratories Ltd. 23 p.
- 47838510 Griffon, B. (2001) CEL 26521 SL: Skin Sensitization Test in Guinea Pigs; Buehler. Project Number: 22020/TSG, 22020/TSG/CEL/265/21/SL/SCOTTS/France/SAS. Unpublished study prepared by Centre International de Toxicologie. 32 p.
- 47848109 Griffon, B. (2003) UKSO48A: Skin Sensitization Test in Guinea Pigs: (Modified Buehler Test: 9 Applications). Project Number: 25646/TSG. Unpublished study prepared by Centre International de Toxicologie. 37 p.
- 47868807 Rodabaugh, D. (2006) A Dermal Sensitization Study in Guinea Pigs with EQEF 303 F5688 Insecticide: Modified Buehler Design. Project Number: KZH00135, A2006/6094. Unpublished study prepared by Charles River Laboratories, Inc. 65 p.
- 48327303 Wrubel, J. (2010) F7180-8 Fly Sticker Insecticide: Request for Bridging of Acute Toxicity Data Requirements. Project Number: NAI/10/004. Unpublished study prepared by Nisso America, Inc. 5 p.
- 48404409 Durando, J. (2010) GWN-9857: Dermal Sensitization Study in Guinea Pigs (Buehler Method). Project Number: 29858, P328. Unpublished study prepared by Eurofins/Product Safety Laboratories. 28 p.
- 48463109 Durando, J. (2011) RF2157 Bait: Dermal Sensitization Study in Guinea Pigs (Buehler Method). Project

Number: P328/WEL, 30979. Unpublished study prepared by Eurofins/Product Safety Laboratories. 25 p.

Developmental neurotoxicity study

- 46255619 Nemec, M. (2003) An Oral Developmental Neurotoxicity Study of Acetamiprid in Rats. Project Number: WIL/21193. Unpublished study prepared by WIL Research Laboratories, Inc. 1643 p.
- 46779201 Nemec, M.; Beck, M.; Slotter, E. (2006) Rebuttal of Data Evaluation Record for Acetamiprid (WIL No. 21193, EPA Acetamiprid 099050, MRID 46255619). Project Number: NAI/06/004, WIL/21193B. Unpublished study prepared by WIL Research Laboratories, Inc. 313 p.
- 46779202 Nemec, M. (2004) A Dose Range-Finding Study for a Developmental Neurotoxicity Study of Acetamiprid in Rats. Project Number: WIL/21192. Unpublished study prepared by WIL Research Laboratories, Inc. 599 p.
- 46779203 Schaefer, G. (2006) Validation of Developmental Neurotoxicity Endpoints in Rats Administered Methimazole in Drinking Water. Project Number: WIL/99199. Unpublished study prepared by WIL Research Laboratories, Inc. 40 p.
- 46779204 Pitt, J. (2006) A Validation Study for Developmental Neurotoxicity Endpoints at WIL Research Laboratories, Inc.: Effect of Proylthiouracil (PTU) on Developmental Neurotoxicity Endpoints in Crl:CD (SD) IGS BR Rats (WIL-99126). Project Number: WIL/99126. Unpublished study prepared by WIL Research Laboratories, Inc. 17 p.
- 47237401 Li, A.; Lau, E. (2007) Acetamiprid DNT Study (WIL-21193; MRID 46255619): Response to EPA CEB Statistical Analyses and Weight of Evidence Supporting NOAEL of 10 mg/kg bwt/day. Project Number: WD0771/000/E0T0. Unpublished study prepared by Exponent Inc. 51 p.

Immunotoxicity

- 48113401 Brown, L. (2010) Acetamiprid: 4-Week Dietary Immunotoxicity Study in the Mouse. Project Number: LGG0005. Unpublished study prepared by Huntingdon Life Sciences, Ltd. 176 p.
- 48113402 Moore, E. (2010) Acetamiprid: 4-Week Dietary Immunotoxicity Study in the Rat. Project Number: LGG0004. Unpublished study prepared by Huntingdon Life Sciences, Ltd. 193 p.

Aquatic invertebrate acute toxicity, test, freshwater daphnids

- 46255608 Saito, S. (2002) IM-1-5 (N-((6-Chloro-3-Pyridyl) methyl)-N-Methylacetamidine): Acute Toxicity to *Daphnia magna*. Project Number: NCAS/02/197. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 23 p.

15.2.A. Physical Chemical and Fate Data

Solubility

- 44651810 Gomyo, T.; Kobayashi, S. (1997) NI-25--Solubility in Organic Solvents: Amended Final Report: Lab Project Number: NISSO 2-83: EC-376-3: 2-83. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 32 p.
- 44651811 Gomyo, T.; Kobayashi, S. (1997) NI-25--Solubility in Water: Amended Final Report: Lab Project Number: NISSO 2-81: EC-377-3: 2-81. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 37 p.

Vapor Pressure

- 44651812 Gomyo, T.; Kobayashi, S. (1997) NI-25--Vapor Pressure: Amended Final Report: Lab Project Number:

NISSO 2-79: EC-372-2: 2-79. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 43 p.

Dissociation Constant

44651813 Gomyo, T.; Kobayashi, S. (1997) NI-25--Dissociation Constant in Water (pKa): Amended Final Report: Lab Project Number: NISSO 2-88: EC-371-2: 2-88. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 30 p.

Oct/Water partition Coef.

44651814 Gomyo, T.; Kobayashi, S. (1997) NI-25--Octanol/Water Partition Coefficient: Amended Final Report: Lab Project Number: NISSO 2-84: EC-378-2: 2-84. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 34 p.

Hydrolysis

44651876 Gomyo, T.; Kobayashi, S. (1997) NI-25--Hydrolysis: Amended Final Report: Lab Project Number: NISSO 2-89: EC-375-2: 2-89. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 126 p.

44651877 Class, T. (1997) Hydrolysis of IM-1-4 and IC-0 (Two Degradates of Acetamiprid) as a Function of pH: Lab Project Number: P 225 G: B 225 G: 97-32. Unpublished study prepared by PTRL Europe. 24 p.

Photodegradation-water

44988509 Hausmann, S.; Class, T. (1998) Aqueous Photodegradation of (carbon-14)-Acetamiprid at pH 7 and Determination of Quantum Yield: Lab Project Number: P196G: B196G: 96-82. Unpublished study prepared by PTRL, West PTRL, Europe. 124 p.

44988510 Emeric, G. (1998) Acetamiprid--Verification of the Identity of the Photolyte Obtained at pH 7--Study: Lab Project Number: 98-47. Unpublished study prepared by Rhone-Poulenc Agro. 36 p.

44988511 Mamouni, A. (1997) Aqueous Photolysis of (carbon-14)-IM-1-4 Under Laboratory Conditions: Lab Project Number: 671332: 97-166. Unpublished study prepared by RCC Umweltchemie. 64 p.

Photodegradation-soil

44988508 Mislankar, S. (1998) Acetamiprid (NI-25) Soil Photolysis: Lab Project Number: EC-97-359: F97125-806: EC-97-359-HP. Unpublished study prepared by Rhone-Poulenc Ag Company. 149 p.

Aerobic soil metabolism

44651879 Feung, C. (1998) Acetamiprid (NI-25): Aerobic Soil Metabolism: Lab Project Number: EC-96-351. Unpublished study prepared by Rhone-Poulenc Ag Company. 122 p.

44651880 Feung, C. (1998) Acetamiprid (NI-25): Metabolism in Collombey Soil: Lab Project Number: EC-97-406. Unpublished study prepared by Rhone-Poulenc Ag Company. 78 p.

44651881 Burr, C. (1997) (Carbon 14)-NI-25: Rate of Aerobic Degradation in Three Soil Types at 20 (degrees Centigrade) and One Soil Type at 10 (degrees Centigrade): Lab Project Number: 11256: 201445. Unpublished study prepared by Rhone-Poulenc Agriculture Limited. 213 p.

44651882 Lowden, P.; Oddy, A.; Jones, M. (1997) NI-25: Rate of Degradation of the Acid Metabolite, (carbon 14)-IC-O in Three Soils: Lab Project Number: 11257: 20147. Unpublished study prepared by Rhone-

Poulenc Agriculture Limited. 153 p.

- 44699101 Morgenroth, U. (1997) (Carbon 14)-NI-25: Metabolism in One Soil Incubated Under Aerobic Conditions: Lab Project Number: 373994. Unpublished study prepared by RCC Umweltchemie AG. 125 p.

Anaerobic aquatic metab.

- 44988512 Feung, C. (1999) Acetamiprid (NI-25): Anaerobic Aquatic Metabolism: Lab Project Number: EC-97-404. Unpublished study prepared by Rhone-Poulenc Ag Co. 128 p.

Aerobic aquatic metab.

- 44988513 Andrawes, N. (1999) Acetamiprid (NI-25): Aerobic Aquatic Metabolism: Lab Project Number: EC-96-352. Unpublished study prepared by Rhone-Poulenc Ag Co. 143 p.

Leach/adsorp/desorption

- 44651883 Liu, A. (1997) Acetamiprid (NI-25): Soil Adsorption/Desorption Study: Lab Project Number: EC-97-381: F97525-001: RP397ACL. Unpublished study prepared by Rhone-Poulenc Ag Company. 180 p.
- 44651884 Liu, A. (1997) 6-Chloronicotinic Acid (Acetamiprid Metabolite): Soil Adsorption/Desorption Study: Lab Project Number: EC-97-370: F97525-001: RP397ACL. Unpublished study prepared by Rhone-Poulenc Ag Company. 195 p.
- 44651885 Liu, A. (1998) (Carbon 14)-N-methyl-(6-chloro-3-pyridyl)- methylamine IM-1-4 (Acetamiprid Metabolite): Soil Adsorption/Desorption Study: Lab Project Number: EC-97-382: F97525-001: RP397ACL. Unpublished study prepared by Rhone-Poulenc Ag Company. 168 p.
- 44651886 Morgenroth, U. (1997) (Carbon 14)-NI-25: Leaching Characteristics of Aged Residues in One Soil: Lab Project Number: 374005. Unpublished study prepared by RCC Umweltchemie AG. 95 p.
- 46255604 Simmonds, M. (2003) (Carbon 14) - Acetamiprid: Aged Residue Column Leaching Study in Two Calcareous Soils. Project Number: CX/02/018, CX02018. Unpublished study prepared by Battelle Agrifood, Ltd. 159 p.

Terrestrial field dissipation

- 44988514 Norris, F. (1999) Acetamiprid: Terrestrial Soil Dissipation of Acetamiprid Following Applications of EXP 80667A 70WP to Ornamental Crops: Lab Project Number: 45752: 97512637. Unpublished study prepared by Rhone-Poulenc Ag Co. and Agvise, Inc. 798 p.
- 44988515 Norris, F. (1999) Acetamiprid: Terrestrial Soil Dissipation of Acetamiprid (EXP 80667A) Under Agricultural Field Conditions Crops: Lab Project Number: 45753: 975126643: 12643-06. Unpublished study prepared by Rhone-Poulenc Ag Co. and ACDS Research, Inc. 788 p.
- 44988516 Yang, J. (1999) Method Validation Report for Acetamiprid (NI-25): Performance Summary of Methods of Analysis for NI-25 and its Metabolites IC-0, IM-1-4, and IM-1-2 in US Soil Using LC/MS/MS: Lab Project Number: 45841: 45453: 9752643. Unpublished study prepared by Rhone-Poulenc Ag Co. 572 p. OPPTS 850.7100
- 44988517 Zheng, S. (1999) Independent Laboratory Validation of Analytical Methods NI-25: Method of Analysis and its Metabolite, IC-0, Using LC/MS/MS; NI-25: Methods of Analysis for IM-1-2 a Metabolite of NI-25 in Soil Using LC/MS/MS; and NI-25: Method of Analysis for IM-1-4, a Metabolite of NI-25, in Soil Using LC/MS/MS: Lab Project Number: 019-016: 98P-019-016: EC-98-447. Unpublished study prepared by Centre Analytical Labs., Inc. 152 p. OPPTS 850.7100

- 44988625 Cosgrove, D. (1999) A Terrestrial Field Dissipation Study with Acetamiprid, Canada, 1999: Final Study Report: Lab Project Number: 99086DC: 99001: 99002. Unpublished study prepared by Enviro-Test Lab., Inc. 388 p.

Confined rotational crop

- 44988623 Mislankar, S.; Mackie, S. (1999) (Carbon-14)-Acetamiprid: Foliar Treatment Confined Accumulation Study in Rotational Crops: Lab Project Number: EC-97-368. Unpublished study prepared by American Agricultural Services, Inc. and Agvise Labs. 345 p. OPPTS 860.1850

General Considerations for efficacy of invertebrate control agents

- 47536601 Smitley, D.; Davis, T.; Newhouse, K. (2007) Acetamiprid: Emerald Ash Borer Tree Trunk Injections and Sprays. Project Number: NAI/08/001. Unpublished study prepared by Michigan State University. 13 p.
- 47558701 Newhouse, K.; Smitley, D.; Davis, T. (2007) Acetamiprid: Emerald Ash Borer Tree Trunk Injections and Sprays; Amendment to MRID 47536601. Project Number: NAI/08/001/01. Unpublished study prepared by Michigan State University. 15 p.

Dissociation constants in water

- 46255602 Takashima, K. (2002) Dissociation Constant of IM-1-5. Project Number: NCAS/02/132. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 18 p.

Photodegradation of parent and degradates in soil

- 48563501 Sugiyama, K. (2011) Photodegradation of [(Carbon 14)] Acetamiprid on Soil by Artificial Sunlight. Project Number: 2126W. Unpublished study prepared by PTRL West, Inc. 235p.

Aerobic soil metabolism

- 46255603 Simmonds, M. (2002) (Carbon 14)-Acetamiprid: Rate of Degradation in Three Calcareous Soils at 20 (Degrees) C. Project Number: CX/01/013. Unpublished study prepared by Battelle Agrifood, Ltd. 198 p.

Anaerobic soil metabolism

- 48554501 Hiler, T. (2011) (Acetamiprid Technical): Anaerobic Soil Metabolism of Carbon 14 Acetamiprid on Two Soil Types. Project Number: 2105W, 2111W. Unpublished study prepared by PTRL West, Inc. 170p.

Non-Guideline Study

- 44651801 Davis, E.; Davis, W. (1998) Reduced Risk and OP Replacement Rationale for Acetamiprid: Lab Project Number: RPAG-NI-25-98. Unpublished study prepared by Rhone Poulenc Ag Company. 148 p.
- 44651818 Morishima, Y. (1997) NI-25 (PAI)--Spectra (UV/VIS, IR, NMR, MS) of NI-25: Lab Project Number: 2-9713: PTL 2-9713. Unpublished study prepared by Nippon Soda Co., Ltd. 20 p. OPPTS 830.7050
- 44651878 Higashida, S. (1998) Stability of IM-1-5 in Water: Lab Project Number: NCAS 98-012NG. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 16 p.
- 44988401 Christian, M.; Cunny, H.; Davis, W. et al. (1999) Reduced Risk and Organophosphate Replacement Rationale for Acetamiprid-Agricultural Uses: Lab Project Number: RR/09/CROP-1. Unpublished study

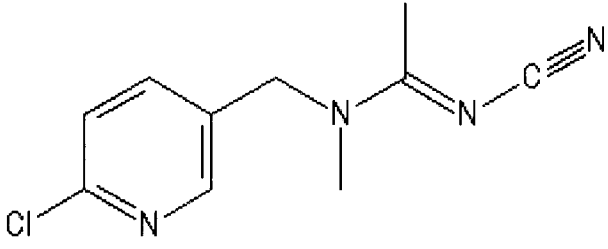
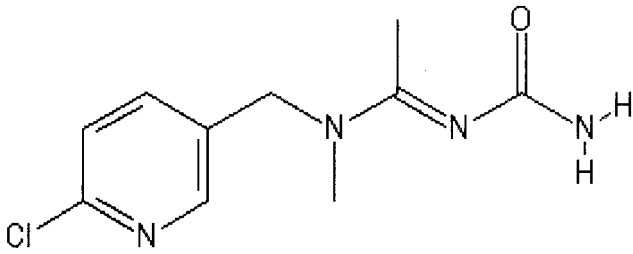
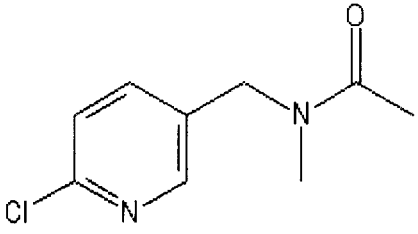
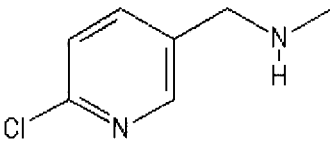
- prepared by Rhone-Poulenc Ag Company. 370 p.
- 44988402 Cunny, H.; Davis, E.; Davis, W. et al. (1999) Reduced Risk and Organophosphate Replacement Rationale for Acetamiprid-Ornamental and Home Garden Uses: Lab Project Number: RR/OP/ORN-2. Unpublished study prepared by Rhone-Poulenc Ag Company. 258 p.
- 44988403 Cunny, H.; Davis, W.; Heintzelman, R. et al. (1999) Acetamiprid: OECD Tier II and Tier III Summary and Assessment of the Active Substance and Formulations, Documents M and N: Lab Project Number: 111599. Unpublished study prepared by Rhone-Poulenc Ag Company. 559 p.
- 44988405 Phillips, J. (1999) Exposure Estimates and Risk Assessment for Acetamiprid. Unpublished study prepared by Rhone Poulenc Ag Company. 20 p.
- 44988412 Johnson, A. (1994) NI-25: Acute Toxicity to the Earthworm (*Eisenia foetida*): Lab Project Number: NPS 63/932526. Unpublished study prepared by Huntingdon Research Centre Ltd. 22 p.
- 44988536 Tokieda, M. (1997) Analytical Method for the Determination of Acetamiprid in Water (Validation Study): Lab Project Number: NCAS97-007: 171-4B. Unpublished study prepared by Nisso Chemical Analysis Service Co., Ltd. 68 p. OPPTS 860.1400
- 45039702 Yang, J. (1999) Stability of Acetamiprid and Its Metabolites in Soil During Prolonged Freezer Storage: Lab Project Number: 97512642: 45754. Unpublished study prepared by Rhone-Poulenc Ag Company. 299 p. OPPTS 860.1380
- 45900500 Nippon Soda Co., Ltd (2003) Submission of Reduced-Risk, Residue, Risk, and Exposure Data in Support of the Amended Registrations of Acetamiprid Technical and Assail 70WP Insecticide and the Petition for Tolerance of Acetamiprid on Tuberous and Corn Vegetables Crop Group and Tobacco. Transmittal of 9 Studies.
- 45900501 Christian, M.; Cunny, H.; Heintzelman, R.; et al. Reduced-Risk Pesticide Rationale for Acetamiprid: Lab Project Number: ACET-RR-01. Unpublished Study. 138 p.
- 45900502 Christian, M. (2003) Reduced-Risk Pesticide Rationale for Acetamiprid: Lab Project Number: ACET-RR-02. Unpublished Study. 4 p.
- 45900503 Yang, H.; Werner, G. (2003) Reduced-Risk Pesticide Rationale for Acetamiprid: Lab Project Number: ACET-RR-03. Unpublished Study. 15 p.
- 45921400 Nippon Soda Co., Ltd. (2003) Submission of Fate Data in Support of FIFRA 6(a)(2) Data Requirements for Assail 70 WP Insecticide. Transmittal of 1 Study.
- 46056901 Li, K. (2003) Acetamiprid Exposure and Risk Assessment: Uses on General Household Pests. Unpublished study prepared by FMC Corporation. 22 p.
- 46056902 Li, K. (2003) Acetamiprid Exposure and Risk Assessment: Termiticide Uses. Unpublished study prepared by FMC Corporation. 13 p.
- 46093700 Gowan Company (2003) Submission of Efficacy Data in Support of the Reregistration of Phosmet. Transmittal of 2 Studies.
- 46093701 Brunner, J. (2001) Control of the Codling Moth with Acetamiprid (Assail) and Phosmet (Imidan), 2001. Project Number: IMI/102/01. Unpublished study prepared by Washington State University. 6 p.
- 46229601 Sances, F. (2003) Evaluation of Assail 70 W for Negative Effects on Lettuce. Project Number: NAI/04/001. Unpublished study prepared by Pacific Agricultural Research Corp. 97 p.
- 46229602 Sances, F. (2003) Addendum Report: Evaluation of Assail 70 W for Negative Effects on Head Lettuce, Butter Varieties. Project Number: NAI/04/002. Unpublished study prepared by Pacific Agricultural Research Corp. 82 p.

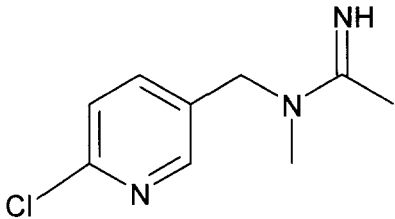
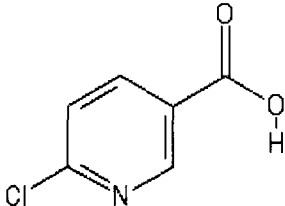
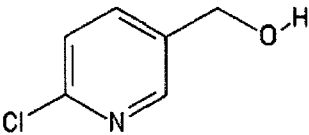
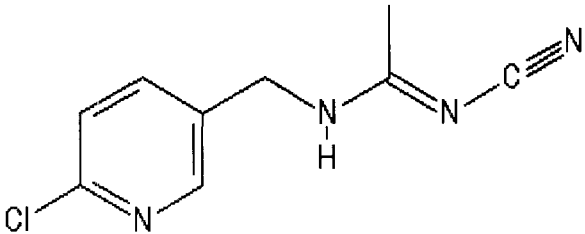
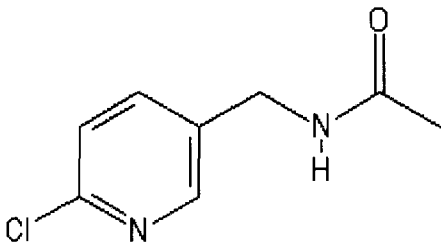
- 46255600 Nippon Soda Co., Ltd. (2004) Submission of Risk/Exposure, Fate, Toxicity and Efficacy Data in Support of the Amended Registrations of Acetamiprid Technical and ASSAIL 70 WP Insecticide and the Petition for Tolerance of Acetamiprid on Cucurbits, Stone Fruit and Tree Nut Crop Groups. Transmittal of 19 Studies.
- 46255605 Kawai, H.; Fujii, Y.; Saika, O.; et. al. (2003) Position Statement on Persistence and Mobility of IM-1-5 in Soil. Project Number: NAI/04/003. Unpublished study prepared by Nippon Soda Co Ltd. 74 p.
- 46255607 Kawai, H. (2003) Position Paper: IM-1-4, Persistence in Sediment. Project Number: RD/03199. Unpublished study prepared by Nippon Soda Co Ltd. 9 p.
- 46255609 Putt, A. (2003) IM-1-5: Full Life-Cycle Toxicity Test with Water Fleas, *Daphnia magna*, Under Static-Renewal Conditions. Project Number: 13798/6112. Unpublished study prepared by Springborn Smithers Laboratories. 62 p.
- 46255610 Putt, A. (2003) IM-1-5: Acute Toxicity to Midge (*Chironomus riparius*) Under Static Conditions. Project Number: 13798/6111. Unpublished study prepared by Springborn Laboratories Inc. 48 p.
- 46255611 Schmitzer, S. (2003) Effects of IM-1-5 on Reproduction of Rove Beetles *Aleochara bilineata* in the Laboratory: (Final Report). Project Number: 15722070. Unpublished study prepared by Institut fuer Biologische Analytik und Consulting IBACON GmbH. 30 p.
- 46255612 Klein, S. (2003) Effects of IM-1-5 on Reproduction of the Collembola *Folsomia candida* in Artificial Soil. Project Number: 15721016, C029622. Unpublished study prepared by Institut fuer Biologische Analytik Und Consulting IBACON GmbH. 27 p.
- 46255613 Rodgers, M. (2002) IM-1-5: Acute Toxicity (LC50) to the Earthworm. Project Number: NOD/217/024192. Unpublished study prepared by Huntingdon Life Sciences, Ltd. 17 p.
- 46255614 Luhers, U. (2003) Effects of IM-1-5 on Reproduction and Growth of Earthworms *Eisenia fetida* in Artificial Soil. Project Number: 15723022. Unpublished study prepared by Institut fuer Biologische Analytik Und Consulting IBACON GmbH. 33 p.
- 46255615 Hatano, R. (2002) Insecticidal Activities of Acetamiprid Metabolites: IM-1-5 and IM-1-5-HCL. Project Number: NAI/04/004. Unpublished study prepared by Nippon Soda Co., Ltd. 7 p.
- 46255620 Fujii, Y. (2002) Acetamiprid Suspended in Corn Oil: Acute Oral Toxicity Study in Rats. Project Number: H221. Unpublished study prepared by Nippon Soda Co., Ltd. 33 p.
- 46255621 Fujii, Y. (2002) IM-1-5: Acute Oral Toxicity Study in Rats. Project Number: H220. Unpublished study prepared by Nippon Soda Co., Ltd. 30 p.
- 46255622 Saito, H. (2002) Metabolism Study of Acetamiprid in Rat (Determination of IM-1-5). Project Number: NSM/02/024. Unpublished study prepared by Nippon Soda Co., Ltd. 112 p.
- 47523404 Iwasa, T.; Motoyama, N.; Ambrose, J.; et al. (2003) Mechanism for the Differential Toxicity of Neonicotinoid Insecticides in the Honey Bee, *Apis mellifera*. *Crop Protection* 23(2004): 371-378.
- 47800502 Nauen, R.; Ebbinghaus-Kintscher, U.; Schmuck, R. (2001) Toxicity and Nicotinic Acetylcholine Receptor Interaction of Imidacloprid and its Metabolites in *Apis mellifera* (Hymenoptera: Apidae). *Pest Management Science* 57(7):577-586.
- 47800507 Aliouane, Y.; el Hassani, A.; Gary, V.; et al. (2009) Subchronic Exposure of Honeybees to Sublethal Doses of Pesticides: Effects on Behavior. *Environmental Toxicology and Chemistry* 28(1):113-122.
- 47800509 Guez, D; Belzunces, L. P.; Maleszka, R. (2003) Effects of Imidacloprid Metabolites on Habituation in Honeybees Suggest the Existence of Two Subtypes of Nicotinic Receptors Differentially Expressed during Adult Development. *Pharmacology, Biochemistry, and Behavior* 75:217-222.

- 47838500 Nippon Soda Co., Ltd. (2009) Submission of Product Chemistry and Toxicity Data in Support of the Application for Registration of Acetamiprid Concentrate Insecticide. Transmittal of 10 Studies.
- 47848100 Nippon Soda Co., Ltd. (2009) Submission of Product Chemistry and Toxicity Data in Support of the Application for Registration of Acetamiprid + Triticonazole Concentrate. Transmittal of 9 Studies.
- 48498301 Laurino, D.; Porporato, M.; Patetta, A.; et al. (2011) Toxicity of Neonicotinoid Insecticides to Honey Bees: Laboratory Tests. Bulletin of Insectology 64(1): 107-113.
- 48499800 Interregional Research Project No. 4 (2011) Submission of Pesticide Use Data in Support of the Proposed New Crop Group 24 - Stalk, Stem and Leafy Petiole. Transmittal of 1 Study.

Appendix A. Supplemental Environmental Fate Information

Table A1. Structures of Acetamiprid and Its Environmental Transformation Products.

| Code Name/ Synonym/ Chemical Name/ Formula/MW/ SMILES | Chemical Structure |
|---|--|
| Acetamiprid IUPAC: (E)-N ¹ -[(6-chloro-3-pyridyl)methyl]-N ² -cyano-N ¹ -methyl CAS: (1E)-N-[(6-chloro-3-pyridinyl)methyl]-N'-cyano-N-methylethanimidamide CAS No.: 135410-20-7 Formula: C ₁₆ H ₁₁ CLN ₄ MW: 222.68 g/mol SMILES: Clc1ncc(cc1)CN(\C(=N\C#N)C)C |  |
| IM-1-2 IUPAC: N ² -carbamoyl-N ¹ -[(6-chloro-3-pyridyl)methyl]-N ¹ -methylacetamidine Formula: C ₁₀ H ₁₃ ClN ₄ O MW: 240.69 g/mol SMILES: C/C(=N\C(=O)N)/N(C)Cc1ccc(nc1)Cl |  |
| IM-1-3 IUPAC: N-[(6-chloro-3-pyridyl)methyl]-N-methylacetamide Formula: C ₉ H ₁₁ ClN ₂ O MW: 198.65 g/mol SMILES: CC(=O)N(C)Cc1ccc(nc1)Cl |  |
| IM-1-4 IUPAC: N-methyl(6-chloro-3-pyridyl)methylamine MW: 155.5 g/mole SMILES: C1=C(C=CC(=C1)CN(C)[H])Cl |  |

| Code Name/ Synonym/ Chemical Name/ Formula/MW/ SMILES | Chemical Structure |
|--|--|
| IM-1-5 IUPAC: (E)-N1-[(6-chloro-3-pyridyl)-methyl]-N2-cyano-N1-methylacetamidine SMILES: <chem>C1=CC(=NC=C1CN(C)C(C)=N)Cl</chem> |  |
| IC-0 IUPAC: 6-Chloronicotinic acid Formula: <chem>C6H4ClNO2</chem> MW: 157.55 g/mol SMILES: <chem>Clc1cc(ncc1C(=O)O)Cl</chem> |  |
| IM-0 IUPAC: (6-Chloro-3-pyridyl)methanol Formula: <chem>C6H6ClNO</chem> MW: 143.57 g/mol SMILES: <chem>Clc1cc(ncc1CO)Cl</chem> |  |
| IM-2-1 IUPAC: N ¹ -[(6-chloro-3-pyridyl)methyl]-N ² -cyanoacetamidine Formula: <chem>C9H9ClN4</chem> MW: 208.65 g/mol SMILES: <chem>C/C(=N/C#N)/NCc1ccc(nc1)Cl</chem> |  |
| IM-2-3 IUPAC: N-[(6-chloro-3-pyridyl)methyl]acetamide Formula: <chem>C8H9ClN2O</chem> MW: 184.62 g/mol SMILES: <chem>CC(=O)NCc1ccc(nc1)Cl</chem> |  |

Abbreviations MW =molecular weight; IUPAC: International Union of Pure and Applied Chemistry name;
SMILES: Simplified Molecular-input Line-entry System

Table A2. Maximum amount of applied radioactivity present as a specified compound in environmental fate studies submitted on acetamiprid.

| Compound | Max %AR (Sampling Interval) | Final %AR (Sampling Interval) | Comment | Study Type | MRID |
|-------------|-----------------------------------|-------------------------------------|-----------------------|--------------------|----------|
| Acetamiprid | Not Applicable | 95 (35 days) | pH 4 all temps | Hydrolysis | 44651876 |
| | | 97. (35 days) | pH 5 all temps | Hydrolysis | 44651876 |
| | | 93 (35 days) | pH 7 all temps | Hydrolysis | 44651876 |
| | | 88 (35 days) | pH 9 all temps | Hydrolysis | 44651876 |
| | | 54 (30 days) | Water | Aqueous Photolysis | 44688509 |
| | | 27 (24 days) | Loamy sand | Soil Photolysis | 48563501 |
| | | 1 (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | | 1 (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | | 1 (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | | <1 (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | | <1 (365 days) | Loamy sand | Aerobic Soil | 44651879 |
| | | nd (7 days) | Sandy Loam | Aerobic Soil | 44651880 |
| | | 46 (182 days) | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | | 3 (182 days) | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | | <1 (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | | 4 (178 days) | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | | 2 (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | | 17 (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| | | 5 (300 days) | Sandy loam | Aerobic Aquatic | 44988513 |
| | | 52 (365 days) | Loamy sand | Anaerobic Aquatic | 44988512 |
| IM-1-4 | <1 (0 days) | <1 (35 days) | pH 4 all temps | Hydrolysis | 44651876 |
| | <1 (0 days) | <1 (35 days) | pH 5 all temps | Hydrolysis | 44651876 |
| | <1 (35 days) | <1 (35 days) | pH 7 all temps | Hydrolysis | 44651876 |
| | 15 (35 days) | 15 (35 days) | pH 9 all temps | Hydrolysis | 44651876 |
| | nd | nd | Water | Aqueous Photolysis | 44688509 |
| | 32 (24 d) | 32 (24 d) | Loamy sand | Soil Photolysis | 48563501 |
| | 21 (7 days) | 1 (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | 21 (7 days) | <1 (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 18 (7 days) | 1 (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | 61 (7 days) | 26 (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | 73 (120 days) | 61 (365 days) | Loamy sand | Aerobic Soil | 44651879 |
| | 16 (7 days) | 16 (7 days) | Sandy Loam | Aerobic Soil | 44651880 |
| | 56 (14 days) | 37 (182 days) | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | 73 (14 days) | 42 (182 days) | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | 67 (3 days) | 1 (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | 73 (30 days) | 54 (178 days) | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | 64 (61 days) | 61 (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | 49 (93 days) | 46 (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| | 64 (60 days) | 34 (300 days) | Sandy loam | Aerobic Aquatic | 44988513 |
| | 27 (270 days) | 27 (270 days) | Loamy sand | Anaerobic Aquatic | 44988512 |
| IM-1-5 | na | na | pH 4 all temps | Hydrolysis | 44651876 |
| | na | na | pH 5 all temps | Hydrolysis | 44651876 |

| Compound | Max %AR (Sampling Interval) | Final %AR (Sampling Interval) | Comment | Study Type | MRID |
|----------|-----------------------------------|-------------------------------------|-----------------------|--------------------|----------|
| | na | na | pH 7 all temps | Hydrolysis | 44651876 |
| | na | na | pH 9 all temps | Hydrolysis | 44651876 |
| | nd | nd | Water | Aqueous Photolysis | 44688509 |
| | na | na | Loamy sand | Soil Photolysis | 48563501 |
| | 16 (187 days) | 16 (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | 12 (187 days) | 12 (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 13 (7 days) | 8 (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | na | na | Collumbey soil | Aerobic Soil | 44699101 |
| | na | na | Loamy sand | Aerobic Soil | 44651879 |
| | na | na | Sandy Loam | Aerobic Soil | 44651880 |
| | na | na | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | nd | nd | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | 22 (13 days) | 13 (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | nd | nd | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | na | na | Sandy loam | Anaerobic Soil | 48554501 |
| | na | na | Clay loam | Anaerobic Soil | 48554501 |
| | na | na | Sandy loam sediment | Aerobic Aquatic | 44988513 |
| | na | na | Loamy sand sediment | Anaerobic Aquatic | 44988512 |
| IC-0 | na | na | pH 4 all temps | Hydrolysis | 44651876 |
| | na | na | pH 5 all temps | Hydrolysis | 44651876 |
| | na | na | pH 7 all temps | Hydrolysis | 44651876 |
| | na | na | pH 9 all temps | Hydrolysis | 44651876 |
| | nd | nd | Water | Aqueous Photolysis | 44688509 |
| | 16 (24 days) | 16 (24 days) | Loamy sand | Soil Photolysis | 48563501 |
| | 5.2 (7 days) | nd (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | 7 (7 days) | nd (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 10 (7 days) | nd (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | 11 (4 days) | 1 (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | 5 (60 days) | 3 (365 days) | Loamy sand | Aerobic Soil | 44651879 |
| | 11 (2 days) | 10 (7 days) | Collumbey Sandy | Aerobic Soil | 44651880 |
| | 11 (120 days) | 4 (182 days) | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | 4 (120 days) | 3 (182 days) | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | 12 (7 days) | nd (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | 3 (178 days) | 3 (178 days) | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | 3 (125 days) | 3 (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | 1 (127 days) | 1 (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| | 19 (180 days) | nd (300 days) | Sandy loam sediment | Aerobic Aquatic | 44988513 |
| | nd | nd (187 days) | Loamy sand sediment | Anaerobic Aquatic | 44988512 |
| IM-1-2 | na | na | pH 4 all temps | Hydrolysis | 44651876 |
| | na | na | pH 5 all temps | Hydrolysis | 44651876 |
| | na | na | pH 7 all temps | Hydrolysis | 44651876 |
| | na | na | pH 9 all temps | Hydrolysis | 44651876 |
| | nd | nd | Water | Aqueous Photolysis | 44688509 |
| | 0.7 (7 d) | nd (24 d) | Loamy sand | Soil Photolysis | 48563501 |
| | 36 (1 day) | nd (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |

| Compound | Max %AR (Sampling Interval) | Final %AR (Sampling Interval) | Comment | Study Type | MRID |
|----------|-----------------------------------|-------------------------------------|-----------------------|--------------------|----------|
| | 29 (3 days) | nd (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 28 (1 days) | nd (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | 8 (1 day) | nd (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | nd | nd | Loamy sand | Aerobic Soil | 44651879 |
| | 55 (1 day) | nd (7 day) | Collumbey Sandy | Aerobic Soil | 44651880 |
| | <LOQ (2 days) | nd (182 days) | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | nd | nd | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | <LOQ (1 day) | nd (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | <LOQ (2 days) | nd (182 days) | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | 4 (5 days) | Nd (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | 3 (7 days) | Nd (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| | 21 (30 days) | 0.74 (300 days) | Sandy loam sediment | Aerobic Aquatic | 44988513 |
| | 1 (90 days) | nd (365 days) | Loamy sand sediment | Anaerobic Aquatic | 44988512 |
| IM-0 | na | na | pH 4 all temps | Hydrolysis | 44651876 |
| | na | na | pH 5 all temps | Hydrolysis | 44651876 |
| | na | na | pH 7 all temps | Hydrolysis | 44651876 |
| | na | na | pH 9 all temps | Hydrolysis | 44651876 |
| | nd | nd | Water | Aqueous Photolysis | 44688509 |
| | nd | nd | Loamy sand | Soil Photolysis | 48563501 |
| | nd | nd | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | 2.21 (7 days) | nd (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 1 (14 days) | nd (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | na | na | Collumbey soil | Aerobic Soil | 44699101 |
| | na | na | Loamy sand | Aerobic Soil | 44651879 |
| | na | na | Collumbey Sandy | Aerobic Soil | 44651880 |
| | na | na | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | na | na | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | na | na | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | na | na | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | 2 (1 day) | nd (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | nd | nd | Clay loam | Anaerobic Soil | 48554501 |
| | na | na | Sandy loam sediment | Aerobic Aquatic | 44988513 |
| | na | na | Loamy sand sediment | Anaerobic Aquatic | 44988512 |
| IM-1-3 | <1 (15 days) | <1 (35 days) | pH 4 all temps | Hydrolysis | 44651876 |
| | <1 (35 days) | <1 (35 days) | pH 5 all temps | Hydrolysis | 44651876 |
| | 4 (22 days) | 4 (35 days) | pH 7 all temps | Hydrolysis | 44651876 |
| | 61 (35 days) | 61 (35 days) | pH 9 all temps | Hydrolysis | 44651876 |
| | nd | nd | Water | Aqueous Photolysis | 44688509 |
| | 4 (24 days) | 4 (24 days) | Loamy sand | Soil Photolysis | 48563501 |
| | nd | nd | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | 3 (7 days) | nd (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 2 (7 days) | nd (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | 3 (4 days) | nd (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | 3 (60 days) | <1 (365 days) | Loamy sand | Aerobic Soil | 44651879 |
| | nd | nd (7 days) | Collumbey Sandy | Aerobic Soil | 44651880 |

| Compound | Max %AR (Sampling Interval) | Final %AR (Sampling Interval) | Comment | Study Type | MRID |
|--------------------------|-----------------------------------|-------------------------------------|-----------------------|--------------------|----------|
| | 3 (28 days) | <1 (182 days) | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | <LOQ (14 days) | <LOQ (14 days) | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | 2 (7 days) | 0.71 (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | 2 (122 days) | 2 (122 days) | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | 3 (5 days) | 3 (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | 2 (24-127 days) | 2 (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| | 1 (90 days) | nd (300 days) | Sandy loam sediment | Aerobic Aquatic | 44988513 |
| | 8 (180 days) | 6 (365 days) | Loamy sand sediment | Anaerobic Aquatic | 44988512 |
| IM-2-1 | 3 (17 days) | 2 (24 days) | Loamy sand | Soil Photolysis | 48563501 |
| | nd | nd | Sandy loam | Anaerobic Soil | 48554501 |
| | nd | nd | Clay loam | Anaerobic Soil | 48554501 |
| IM-2-3 | nd | nd | Loamy sand | Soil Photolysis | 48563501 |
| | 2 (5 days) | nd (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | 1 (11 days) | nd (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| Unidentified Compound | 3 (14 days) | nd (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | 1 (14 days) | nd (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 4 (187 days) | 4 (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | 4 (4 days) | nd (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | 2 (3 days) | nd (365 days) | Loamy sand | Aerobic Soil | 44651879 |
| | 12 (7 days) | 12 (7 days) | Collumbey Sandy | Aerobic Soil | 44651880 |
| | 3 (56 days) | 2 (182 days) | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | <1 (56 days) | <1 (56 days) | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | <1 (7 days) | nd (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | <1 (182 days) | <1 (182 days) | Clay loam, 10°C | Aerobic Soil | 44651881 |
| Unextracted Residues | 26 (118 days) | 19 (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| | 31 (28 days) | 20 (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 29 (14 days) | 28 (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | 16 (112 days) | 16 (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | 21 (365 days) | 21 (365 days) | Loamy sand | Aerobic Soil | 44651879 |
| | 14 (7 days) | 14 (7 days) | Collumbey Sandy | Aerobic Soil | 44651880 |
| | 40 (182 days) | 40 (182 days) | Clay loam, 20°C | Aerobic Soil | 44651881 |
| | 26 (182 days) | 26 (182 days) | Sandy loam, 20°C | Aerobic Soil | 44651881 |
| | 21 (28 days) | 18 (182 days) | Silty clay loam, 20°C | Aerobic Soil | 44651881 |
| | 25 (178 days) | 25 (178 days) | Clay loam, 10°C | Aerobic Soil | 44651881 |
| | 31 (91 days) | 30 (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | 42 (93 days) | 36 (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| | 38 (300 days) | 38 (300 days) | Sandy loam sediment | Aerobic Aquatic | 44988513 |
| | 17 (270 days) | 17 (365 days) | Loamy sand sediment | Anaerobic Aquatic | 44988512 |
| | 3 (16-24 days) | 3 (24 days) | Loamy sand | Soil Photolysis | 48563501 |
| | 52 (118 days) | 50 (187 days) | Sandy Loam 01/07 | Aerobic Soil | 46255603 |
| CO ₂ | 54 (91 days) | 54 (187 days) | Clay loam 01/08 | Aerobic Soil | 46255603 |
| | 57 (118 days) | 51 (187 days) | Clay loam 01/10 | Aerobic Soil | 46255603 |
| | <1 (30 days) | <1 (30 days) | Water | Aqueous photolysis | 44688509 |
| | 56 (112 days) | 56 (112 days) | Collumbey soil | Aerobic Soil | 44699101 |
| | 19 (270 days) | 12 (365 days) | Loamy sand | Aerobic Soil | 44651879 |

| Compound | Max %AR (Sampling Interval) | Final %AR (Sampling Interval) | Comment | Study Type | MRID |
|----------|-----------------------------------|-------------------------------------|---------------------|-------------------|----------|
| | 44 (7 days) | 44 (7 days) | Collumbey Sandy | Aerobic Soil | 44651880 |
| | 1 (9 days) | 0.3 (125 days) | Sandy loam | Anaerobic Soil | 48554501 |
| | 0.6 (3 days) | 0.4 (127 days) | Clay loam | Anaerobic Soil | 48554501 |
| | 5 (300 days) | 5 (300 days) | Sandy loam | Aerobic Aquatic | 44988513 |
| | 1 (365 days) | 1 (365 days) | Loamy sand sediment | Anaerobic Aquatic | 44988512 |

na=not analyzed; nd=not detected; AR=applied radioactivity

If a study is not listed under a specific analyte, it was not analyzed in the study.

Table A3. Summary of environmental fate and transport properties of IC-0 (6-chloronicotinic acid), a degradate of acetamiprid

| Parameter | Value(s) | Source | Study Classification | Comment |
|---|---|---------------|----------------------|---|
| Aerobic Soil Metabolism Half-life | Half-life, linear regression ¹ : 2.5 days (sandy loam soil at 20°C) 1.7 days (clay soil at 20°C) 6.6 days (loam soil at 20°C) | MRID 44651882 | Supplemental | British soils and USDA classification could not be determined. Unextracted residues ranged from 3.1-20.7% of applied radioactivity. Half-lives calculated using a subset of data for clay and loam soils. |
| Solid-water distribution coefficient (K _d) | Average K _d in L/kg at 20°C: 0.44, loamy sand, pH 4.4 0.83, loam sand II, pH 6.2 0.28, silt loam, pH 6.6 0.28, clay, pH 7.5 2.36, sandy loam sediment, pH 5.6 | MRID 44651884 | Acceptable | |
| Freundlich solid-water distribution coefficient (K _F) | K _F in L/kg (1/n) at 20°C: 0.40 (0.91), loamy sand, pH 4.4 0.79 (1.0), loam sand II, pH 6.2 0.26 (0.94), silt loam, pH 6.6 0.19 (0.82), clay, pH 7.5 1.81 (0.86), sandy loam sediment, pH 5.6 | MRID 44651884 | Acceptable | Freundlich exponents indicate that sorption was dependent on concentration in some soils. |
| Organic-carbon normalized distribution coefficient (K _{OC}) | Average K _{OC} in L/kg OC at 20°C: 177, loamy sand, pH 4.4 56, loam sand II, pH 6.2 64, silt loam, pH 6.6 34, clay, pH 7.5 94, sandy loam sediment, pH 5.6 | MRID 44651884 | Acceptable | None |

Appendix B. Summary of Available Effects Studies

Aquatic Organisms

Tables B1 to B7 contain all available aquatic toxicity endpoints from registrant-submitted studies. Below is a brief summary of available aquatic toxicity studies.

Fish and Aquatic-Phase Amphibians

Two acute toxicity studies (**Table B1**) have been submitted examining the effect of acetamiprid on freshwater fish. A 96-hr flow-through study with the bluegill sunfish (*Lepomis macrochirus*; MRID 44651863) was conducted at measured concentrations of 0 (control), 11.8, 20.0, 35.4, 65.0 and 119.3 mg ai/L. No mortality was observed in any of the test concentrations with the $LC_{50} > 100$ mg ai/L. Darkened body pigmentation was observed in all fish at all treatments, therefore the NOAEC for the study, based on alterations in fish coloration is < 11.8 mg ai/L. A 96-hr flow-through study was conducted with rainbow trout (*Oncorhynchus mykiss*; MRID 44651864) at nominal concentrations of 0 (control), 25, 35, 50, 70 and 100 mg ai/L. Mortality was limited to 20% at the highest concentration, with the $LC_{50} > 100$ mg ai/L. However, sublethal effects, including darkened body pigmentation, swollen abdomen and loss of equilibrium were reported in 20% of the fish at both the 50 and 70 mg ai/L concentrations and 90% at the 100 mg ai/L concentration. The NOAEC for the study is 35 mg ai/L. Acetamiprid is classified as practically nontoxic to freshwater fish on an acute exposure basis, however sublethal effects were noted.

A 96-hr static renewal acute exposure study of the effects of the degradate IM-1-4 on rainbow trout is available (MRID 44651865) (**Table B1**). The fish were exposed at measured concentrations of 4.3, 8.5, 16.9, 33.8, 69.3 and 98.1 mg ai/L. The 98.1 mg ai/L concentration was buffered and conducted separately after mortality of 100% was observed in the unbuffered 69.3 mg ai/L concentration. The pH of the 69.3 mg ai/L replicates ranged from 9.0 to 9.3, which may account for the mortality. No mortalities were reported in the other concentrations. Sublethal effects, including darkened body pigmentation and surface swimming were observed in all concentrations above 4.3 mg ai/L (the NOAEC for the study). The LC_{50} is > 98.1 mg ai/L; the degradate IM-1-4 is classified as practically nontoxic to freshwater fish on an acute exposure basis.

Table B1. Acute toxicity of technical grade acetamiprid and degradate IM-1-4 to freshwater fish.

| Species | Test substance | LC ₅₀ mg ai/L | Toxicity Category | MRID | Study Classification |
|--|------------------------------|-----------------------------|-----------------------|----------|----------------------|
| Rainbow trout (<i>Oncorhynchus mykiss</i>) | Technical acetamiprid | >100 | Practically non-toxic | 44651864 | Acceptable |
| Bluegill sunfish (<i>Lepomis macrochirus</i>) | Technical acetamiprid | >100 | Practically non-toxic | 44651863 | Acceptable |
| Rainbow trout (<i>Oncorhynchus mykiss</i>) | 94.5% IM-1-4 degradate | >98.1 | Practically non-toxic | 44651865 | Supplemental |

In a 96-h flow-through acute toxicity study (**Table B2**), estuarine/marine sheepshead minnows (*Cyprinodon variegatus*) were exposed to measured acetamiprid concentrations of 0 (control), 19, 32, 54, 90 and 150 mg ai/L. Mortality was 10% in the 90 mg ai/L and 100% in the 150 mg ai/L test concentrations. Lethargy was observed in all of the surviving fish at the 90 mg ai/L treatment level. No other sublethal effects were reported. The 96-hr LC₅₀ is 100 mg ai/L, which classifies acetamiprid as slightly toxic to estuarine/marine fish on an acute exposure basis.

Table B2. Acute toxicity of technical grade acetamiprid to estuarine/marine fish.

| Species | Test Substance | LC ₅₀ mg ai/L | Toxicity Category | MRID | Study Classification |
|---|-----------------------|-----------------------------|-------------------|----------|----------------------|
| Sheepshead minnow (<i>Cyprinodon variegatus</i>) | Technical acetamiprid | 100* | Slightly toxic | 44988411 | Acceptable |

* Most sensitive endpoint

A 35-day flow-through fish early life stage toxicity study (MRID 44651872) was submitted to evaluate the effect of chronic exposure on freshwater fish. Fathead minnow (*Pimephales promelas*) were exposed to acetamiprid at measured concentrations of 9.9, 19.2, 38.4, 76.0, and 147.5 mg ai/L. Mortalities were reported at 5% 20% and 100% in concentrations 38.4, 76.0 and 147.5 mg ai/L, respectively. Weights were reduced 17% and 62% at concentrations 38.4 and 76.0 mg ai/L. The lowest observed adverse effect concentration (LOAEC) for the study is 38.4 mg ai/L based on decreased survival and growth. The NOAEC is 19.2 mg ai/L (**Table B3**).

No chronic toxicity data have been submitted for estuarine/marine fish.

Table B3. Early life-stage toxicity of technical grade acetamiprid to freshwater fish.

| Species | Test Substance | NOAEC | LOAEC | Endpoints Affected | MRID | Study Classification |
|---|-----------------------|---------------|--------------|---|----------|----------------------|
| Fathead minnow (<i>Pimphales promelas</i>) | Technical acetamiprid | 19.2 mg ai/L* | 38.4 mg ai/L | Embryo and larval survival, larval growth (wet-weight and length) | 44651872 | Supplemental |

* Most sensitive endpoint

Aquatic Invertebrates

An acute toxicity study was submitted to assess the effect of acetamiprid on the water flea (*Daphnia magna*; MRID 44651866) at nominal concentrations of 0 (control), 12.5, 25, 50, 100 and 200 mg ai/L. Immobile daphnids were observed at 20%, 45%, 85% and 100% at concentrations of 25, 50, 100 and 200 mg ai/L. The LC₅₀ for daphnids is 50 mg ai/L and the NOAEC, based on immobility, is 12.5 mg ai/L (**Table B4**).

A 96-hr acute toxicity study (MRID 45932501) was submitted for the freshwater amphipod, *Gammarus fasciatus*. Test organisms were exposed at measured concentrations of 0 (control), 9.4, 18, 33, 76 and 140 µg ai/L. Mortality was 5% in the control and 0, 10, 40, 35 and 70%, in the treatment groups respectively. Lethargy was observed at the 33 µg ai/L concentration and higher. The LC₅₀ is 80 µg ai/L and the NOAEC is 18 µg ai/L based on lethargy. The slope of the dose-response curve is 1.89. Based on a 96-hr LC₅₀ value of 80 µg ai/L, acetamiprid is classified as very highly toxic to freshwater invertebrates on an acute exposure basis.

The 48-hour acute toxicity of acetamiprid (technical) to the midge, *Chironomus riparius*, was studied under static conditions (MRID 45916201). Test organisms were exposed to negative control, solvent (acetone) control and test chemical at a single dosing nominal concentrations of 6.3, 13, 25, 50, and 100 µg/L (corresponding mean-measured concentrations were 6.0, 14, 26, 46 and 110 µg ai/L) in overlying water. Mortality was recorded at 0, 24 and 48 hours. After 48 hours of static exposure to acetamiprid in the presence of sediment, the 48-hr LC₅₀ is 20.9 µg ai/L based on mean-measured concentrations. The NOAEC is 6 µg ai/L, based on mortality.

An aquatic invertebrate study with acetamiprid was identified in the ECOTOX database (Beketov and Liess, 2008). In this study, amphipods (*Gammarus pulex*), blackfly larvae (*Simulium latigonium*), and mayfly larvae (*Baetis rhodani*) were exposed to as single concentration of acetamiprid for 96 hours under static conditions; LC₅₀ values were subsequently determined. The results and scientific soundness of this study will be evaluated prior to endpoint selection for the upcoming acetamiprid registration review risk assessment.

The 48-hr-acute toxicity of the IM-1-4 degradate to *Daphnia magna* was studied under static renewal conditions at mean measured concentrations of 6.9, 13.9, 28.0, 55.9 and 113.0 mg ai/L. The 48- hour EC₅₀ was 43.9 mg ai/L. The NOAEC based on mortality/immobilization was 6.9 mg ai/L. Based on the results of this study, IM-1-4 is classified as slightly toxic to *Daphnia magna*. Two other acute exposure studies evaluating the toxicity of acetamiprid degradates IC-0 and IM-1-2 to daphnids are available, and resulted in EC₅₀ values that were greater than the highest concentration tested; therefore, these degradates are classified as practically non-toxic to daphnids on an acute exposure basis.

In a 48-hour static acute toxicity study, effects of the acetamiprid degradate IM-1-5 to the sediment-dwelling freshwater midge, *Chironomus riparius*, were assessed (MRID 46255610). Test organisms were exposed to mean-measured concentrations (in the overlying water) of 0 (control), 6.0, 14, 26, 46 and 110 µg ai/L. The 48-hr LC₅₀ is 68 mg ai/L based on mean-measured concentrations. The NOAEC is 49 mg ai/L, based on mortality. The acetamiprid degradate IM-1-5 is classified as slightly toxic to freshwater invertebrates on an acute exposure

basis.

Table B4. Acute toxicity of acetamiprid and degradates to freshwater invertebrates.

| Species | Test substance | EC ₅₀ /LC ₅₀ mg ai/L | Toxicity Category | MRID | Study Classification |
|---|---------------------------|---|-----------------------|----------|----------------------|
| Waterflea (<i>Daphnia magna</i>) | Technical acetamiprid | 50 | Slightly toxic | 44651866 | Supplemental |
| Amphipod (<i>Gammarus fasciatus</i>) | Technical acetamiprid | 0.08 | Very highly toxic | 45932501 | Supplemental |
| Midge (<i>Chironomus riparius</i>) | Technical acetamiprid | 0.021* | Very highly toxic | 45916201 | Supplemental |
| Waterflea (<i>Daphnia magna</i>) | 99.7% IC-0 degradate | >95.1 | Practically non-toxic | 44988409 | Acceptable |
| Waterflea (<i>Daphnia magna</i>) | 99.6% IM-1-2 degradate | >99.8 | Practically non-toxic | 44651867 | Acceptable |
| Waterflea (<i>Daphnia magna</i>) | 98.7% IM-1-4 degradate | 43.9 | Slightly toxic | 44651868 | Acceptable |
| Midge (<i>Chironomus riparius</i>) | 98.9% IM-1-5 degradate | 68 | Slightly toxic | 46255610 | Acceptable |

* Most sensitive endpoint

In a 96-hr acute flow-through toxicity study, mysid shrimp (*Americamysis bahia*) were exposed to mean measured concentrations of 0 (control), 13, 23, 36, 64 and 110 µg ai/L. Mortality was 5%, 10% and 35% and 90% in the 23, 36, 64 and 110 µg ai/L treatment levels respectively. Lethargy was reported in all of the surviving mysids exposed to the 64 and 110 µg ai/L treatment levels. The LC₅₀ is 66 µg ai/L and the NOAEC is 13 µg ai/L based on lethargy; acetamiprid is classified as very highly toxic to mysid shrimp on an acute exposure basis (**Table B5**).

In a 96-hr-acute flow-through toxicity study, Eastern oysters (*Crassostrea virginica*) were exposed to mean measured concentrations of 0 (control), 14, 24, 38, 58 and 100 mg a.i./L. No mortality was observed. Shell growth among oysters exposed to the 24, 38, 58 and 100 mg ai/L test concentrations was 2.1, 1.7, 0.80 and 0.41 mm respectively, which was significantly reduced compared to control growth (2.9 mm). The 96-hr EC₅₀ for shell growth inhibition is 41 mg a.i./L; therefore, acetamiprid is classified as slightly toxic to eastern oysters on an acute exposure basis.

In a 96-hr static acute toxicity study with the degradate IM-1-4, mysid shrimp (*A. bahia*) were exposed to mean measured concentrations of 0 (control), 3.2, 6.7, 14, 27, 55 and 110 mg a.i./L. Mortality was 5%, 35%, 65%, 95% and 100% in the 6.7, 14, 27, 55 and 110 mg a.i./L treatment levels, respectively. Lethargy was reported in all of the surviving mysids exposed to the 27 and 55 mg ai/L treatment levels. The LC₅₀ is 19 mg a.i./L and the NOAEC is 3.2 mg a.i./L; IM-1-4 is classified as slightly toxic to estuarine/marine invertebrates on an acute exposure basis.

Table B5. Acute toxicity of acetamiprid and degradates to estuarine/marine invertebrates.

| Species | Test substance | LC ₅₀ mg ai/L | Toxicity Category | MRID | Study Classification |
|--|--------------------------|-----------------------------|----------------------|----------|-------------------------|
| Eastern oyster shell deposition (<i>Crassostrea virginica</i>) Flow-through | Technical acetamiprid | 41 | Slightly toxic | 44988410 | Acceptable |
| Mysid (<i>Americamysis bahia</i>) | Technical acetamiprid | 0.066* | Very highly toxic | 44651869 | Acceptable |
| Mysid (<i>Americamysis bahia</i>) | 99.6% IM-1-4 | 19 | Slightly toxic | 44651870 | Acceptable |

* Most sensitive endpoint

A 21-day chronic toxicity study was conducted with daphnids at concentrations of 0 (control), 2, 5, 9, 18, 37 and 74 mg ai/L (MRID 44651871). Survival was reduced to 57% at the highest test concentration. Significant reduction in length (8%), weight (24%) and mean number of offspring (50%) were observed at 9 mg ai/L, the LOAEC. The NOAEC is 5 mg ai/L based on reduced growth and reproduction (**Table B6**).

A 21-day chronic toxicity study of degradate IM-1-5 was conducted with daphnids at nominal concentrations of 0 (control), 6.3, 13, 25, 50 and 100 mg ai/L (MRID 44651871). Significant reduction in mean number of offspring (30%) was observed at 50 mg ai/L, the LOAEC. The NOAEC is 25 mg ai/L based on impaired reproduction.

A 28-day flow-through chronic toxicity study was conducted with mysid shrimp exposed at mean measured concentrations of 0 (control), 0.93, 1.4, 2.5, 4.7, 10 and 20 µg ai/L. Survival rates of 85%, 80%, 92%, 93%, 93% and 63% was observed in the 0.93, 1.4, 2.5, 4.7, 10 and 20 µg ai/L treatment levels respectively. Only the 20 µg ai/L was statistically significant different from the control in terms of reduced survival, and further analyses were not conducted on this concentration. Reduction in male dry body weight was the most sensitive endpoint; the NOAEC is 2.5 µg ai/L and the LOAEC is 4.7 µg ai/L.

Table B6. Chronic toxicity of acetamiprid and degradates to aquatic invertebrates.

| Species | Test Substance | NOAEC | LOAEC | Endpoints Affected | MRID | Study Classification |
|--|---------------------------|--------------------|-------------------|------------------------------------|----------|----------------------|
| Waterflea (<i>Daphnia magna</i>) | Technical acetamiprid | 5.0 mg ai/L | 9.0 mg ai/L | Reduced offspring production | 44651871 | Acceptable |
| Waterflea (<i>Daphnia magna</i>) | 98.9% IM-1-5 degradate | 25 mg ai/L | 51 mg ai/L | Number of young per female | 46255609 | Supplemental |
| Mysid (<i>Americamysis bahia</i>) | Technical acetamiprid | 0.0025 mg ai/L* | 0.0047 mg ai/L | Reduced body weight in males | 44651873 | Acceptable |

* Most sensitive endpoint

Aquatic Plants

Tier 1 toxicity testing with aquatic nonvascular plants indicates that acetamiprid had no effect on the growth of green algae *Pseudokirchneriella subcapitata*, cyanobacteria *Anabaena flos-aquae*, freshwater diatoms *Navicula pelliculosa* or marine diatoms *Skeletonema costatum* at the highest concentrations tested (range: 1.0 to 1.3 mg ai/L) (**Table B7**). Tier 1 toxicity testing with aquatic vascular plants indicates that acetamiprid had no effect on the growth of duckweed (*Lemna gibba*) at the highest concentration tested, *i.e.*, 1.0 mg ai/L.

Table B7. Toxicity of acetamiprid to aquatic plant species.

| Species | Test substance | NOAEC (mg ai/L) | EC ₅₀ (mg ai/L) | MRID | Study Classification |
|--|-----------------------|-----------------|----------------------------|----------|----------------------|
| <i>Aquatic Vascular Plants</i> | | | | | |
| Duckweed (<i>Lemna gibba</i>) | Technical acetamiprid | 1.0 | >1.0 | 44988415 | Acceptable |
| <i>Aquatic Non-vascular Plants</i> | | | | | |
| Green algae (<i>Pseudokirchneriella subcapitata</i>) | Technical acetamiprid | 1.3 | >1.3 | 44988414 | Acceptable |
| Marine diatom (<i>Skeletonema costatum</i>) | Technical acetamiprid | 1.0 | >1.0 | 44988418 | Acceptable |
| Freshwater diatom (<i>Navicula pelliculosa</i>) | Technical acetamiprid | 1.1 | >1.1 | 44988417 | Acceptable |
| Cyanobacteria (<i>Anabaena flos-aquae</i>) | Technical acetamiprid | 1.3 | >1.3 | 44988416 | Acceptable |

Terrestrial Organisms

Tables B8 to B15 contains all available terrestrial toxicity endpoints from registrant-submitted studies. Below is a brief summary of available terrestrial toxicity studies.

Birds

The acute oral toxicity of acetamiprid to 4-to-8-month-old zebra finches (*Taeniopygia guttata* aka *poephila guttata*) was assessed over 14 days. Acetamiprid was administered to birds at nominal doses of 1.8, 2.5, 3.6, 5, 7, and 10 mg ai/kg bw. The 14-day acute oral LD₅₀ is 5.68 mg ai/kg bw (**Table B8**). At least one clinical sign of toxicity or observation of abnormal behavior was recorded in all treatment groups, but not in the control group. Symptoms ranged from transient ruffled appearance in the lowest dose group (1.8 mg ai/kg bw) to lethargy, wing droop, prostrate posture, loss of coordination, loss of righting reflex, depressed behavior, and minor muscle fasciculation in higher dose groups. Acetamiprid is therefore classified as very highly toxic to zebra finches on an acute oral exposure basis.

The acute oral toxicity of acetamiprid to mallard ducks (*Anas platyrhynchos*) was assessed over 14 days at measured doses of 0 (control), 43, 64, 85, 124, and 181 mg ai/kg-bw. Mortality was 0% in the control and 43 mg ai/kg-bw doses, and 40%, 40% 80% and 100% in the 64, 85, 124

and 181 mg ai/kg-bw doses. Sublethal effects, including abnormal behavior and loss of coordination, were reported at all doses. The 14-day LD₅₀ is 84.4 mg ai/kg-bw; the NOAEL is <43 mg ai/kg-bw based on impaired behavior. Acetamiprid is classified as moderately toxic to mallard ducks on an acute oral exposure basis (**Table B8**).

Table B8. Acute oral toxicity of technical grade acetamiprid to birds.

| Species | Test Substance | LD ₅₀ (mg ai/kg-bw) | Toxicity Category | MRID | Study Classification |
|---|-----------------------|-----------------------------------|-------------------|----------|----------------------|
| Zebra finch (<i>Taeniopygia guttata</i>) | Technical acetamiprid | 5.68* | Very highly toxic | 48407701 | Acceptable |
| Mallard duck (<i>Anas platyrhynchos</i>) | Technical acetamiprid | 84.4 | Moderately toxic | 44651859 | Acceptable |

* Most sensitive endpoint

The subacute dietary toxicity of acetamiprid to mallard duck was assessed at concentrations of 0 (control), 200, 1000 and 5000 mg a.i/kg-diet. Mortality was 10% at the 1000 mg ai/kg-diet concentration and 40% at the 5000 mg ai/kg-diet concentration. Sublethal effects including imbalance and reduced food consumption were reported at in all surviving birds at the 1000 and 5000 mg ai/kg-diet concentrations. The subacute dietary LC₅₀ is >5000 mg ai/kg-diet. The NOAEC is 200 mg ai/kg-diet based on reduced survival, behavioral effects and reduced food consumption. Acetamiprid is classified as slightly toxic to birds on a subacute dietary exposure basis (**Table B9**).

The subacute dietary toxicity of acetamiprid to 10-day old bobwhite quail (*Colinus virginianus*) was assessed at concentrations of 0 (control), 1000 and 5000 mg ai/kg-diet. Mortality was 20% at the 5000 mg ai/kg-diet concentration, the only mortalities in the study. Food consumption was markedly depressed in the 5000 mg ai/kg-diet treatment group, the only sublethal effect reported. The LC₅₀ is >5000 mg ai/kg-diet and the NOAEC is 1000 mg ai/kg-diet based on reduced survival and decreased food consumption. Acetamiprid is classified as practically nontoxic to bobwhite quail on a subacute dietary basis.

The subacute dietary toxicity of the acetamiprid degradate IM-1-4 to mallard duck was assessed at test concentrations of 0 (control), 5, 50, 500, 2500 and 5000 mg ai/kg-diet. No mortalities or sublethal effects were reported. The subacute dietary LC₅₀ is >5000 mg ai/kg-diet. The NOAEC is 5000 mg ai/kg-diet. IM-1-4 is classified as practically nontoxic to birds on a subacute dietary exposure basis.

Table B9. Subacute dietary toxicity of acetamiprid to birds.

| Species | Test substance | LC ₅₀ (mg ai/kg-diet) | Toxicity Category | MRID | Study Classification |
|--|-----------------------|-------------------------------------|-----------------------|----------|----------------------|
| Mallard duck (<i>Anas platyrhynchos</i>) | Technical acetamiprid | >5000 | Practically non-toxic | 44651861 | Supplemental |
| Bobwhite quail (<i>Colinus virginianus</i>) | Technical acetamiprid | >5000 | Practically non-toxic | 44651860 | Supplemental |
| Mallard duck (<i>Anas platyrhynchos</i>) | IM-1-4 degradate | >5000 | Practically non-toxic | 44651862 | Acceptable |

Chronic toxicity to birds was uncertain in past risk assessments because of deficiencies in the avian reproduction studies with both the mallard (MRID 44988408) and the northern bobwhite quail (MRID 44988407). The initial mallard duck reproduction study provided an estimated NOAEC of 125 mg ai/kg diet based on reductions in adult female body weight. The previous bobwhite quail reproduction study showed significant reductions in hatchling body weights at all treatment concentrations and thus failed to establish a NOAEC; the LOAEC was 250 mg ai/kg-diet. Subsequent studies were submitted (**Table B10**).

In a one-generation reproductive toxicity study (MRID 46369204), acetamiprid was administered to mallard ducks at measured concentrations of 0 (control), 60.2, 134, 258, and 461 mg ai/kg-diet. Both male and female body weight gains were statistically-reduced compared to the controls; the male body weights were affected at all treatment levels (70% at lowest treatment), while female body weight gains were reduced at the 258 and 461 mg ai/kg-diet treatment levels (roughly 50%). No other effect on any adult parameter was observed. The number of eggs laid was statistically-reduced at the 461 mg ai/kg-diet level compared to the control (673 versus 896 eggs for 17 laying pairs). In addition, the number of eggs set, the number of viable embryos, and hatchling weights were statistically-reduced at the 461 mg ai/kg-diet level. No other effect on any reproductive endpoint was observed. Based on a statistically significant 3% decrease in male bodyweight gain in the lowest treatment group, a NOAEC was not established for the study, i.e., NOAEC < 60.2 mg ai/kg diet; the LOAEC is 60.2 mg ai/kg-diet. The NOAEC for reproductive effects is 258 mg ai/kg-diet.

In a one-generation reproductive toxicity study (MRID 46555601), acetamiprid was administered to bobwhite quail at measured concentrations of 0 (control), 89.7, 184, 385 and 775 mg ai/kg-diet. No treatment-related effects were observed on adult survival or food consumption, or upon terminal necropsy of all decedent and surviving birds. There was a significant reduction (18%) in adult female body weight change at the highest treatment level. There were significant reductions in eggs set, viable embryos, viable embryos to eggs set, live embryos, number hatched, number of hatchlings to eggs laid, hatchling survival, hatchling survival to eggs set and hatchling survival to number hatched. The NOAEC and LOAEC for the study are 89.7 and 184 mg ai/kg-diet, respectively.

Table B10. Reproductive chronic toxicity of technical grade acetamiprid to birds.

| Species | Test Substance | NOAEC (mg ai/kg diet) | LOAEC (mg ai/kg-diet) | MRID | Study Classification |
|---|-----------------------|-----------------------|-----------------------|----------|----------------------|
| Mallard duck (<i>Anas platyrhynchos</i>) | Technical acetamiprid | <60.2* | 60.2 | 46369201 | Supplemental |
| Northern bobwhite quail (<i>Colinus virginianus</i>) | Technical acetamiprid | 89.7 | 184 | 46555601 | Acceptable |

* Most sensitive endpoint

Mammals

The available data indicate that acetamiprid is moderately toxic to mammals on an acute oral exposure basis (LD₅₀=146 mg ai/kg-bw). The original Section 3 risk assessment reported an LD₅₀=167 mg ai/kg. Acute oral toxicity tests were also conducted on several metabolites and degradation products of acetamiprid. Results of these tests show that these compounds are considerably less toxic than the parent compound, and are classified as slightly toxic or practically nontoxic to mammals (Table B11).

Table B11. Acute toxicity of acetamiprid and degradates to mammals.

| Species | Test substance | LD ₅₀ (mg ai/kg-bw) | Toxicity Category | MRID | Classification |
|--|--------------------------|--------------------------------|----------------------|----------|----------------|
| Laboratory rat <i>Rattus rattus</i> | Technical acetamiprid | 146 | Moderately toxic | 44651833 | Acceptable |
| Laboratory rat <i>Rattus rattus</i> | IM-1-4 (99.6%) degradate | 1088 | Slightly toxic | 44651834 | Acceptable |
| Laboratory rat <i>Rattus rattus</i> | IM-1-2 (99.9%) degradate | 2176 | Practically nontoxic | 44988422 | Acceptable |
| Laboratory rat <i>Rattus rattus</i> | IM-1-2 (99.6%) degradate | >5000 | Practically nontoxic | 44651835 | Acceptable |
| Laboratory rat <i>Rattus rattus</i> | IM-0 degradate | 1792 | Practically nontoxic | 44988421 | Acceptable |
| Laboratory rat <i>Rattus rattus</i> | IC-0 degradate | >5000 | Practically nontoxic | 44988420 | Acceptable |

Consistent results were reported for two chronic studies and a 13-week subchronic study of acetamiprid in rats (Table B12). Reduction in growth, as measured by body weight, weight gain, and food consumption, were observed at test concentrations of 400-800 mg ai/kg-diet and greater, whereas test concentrations of 160-280 mg ai/kg-diet caused no significant effects. In

addition to growth endpoints, reproductive effects were also observed at 280 mg ai/kg-diet in a two-generation study (MRID 44988430). The NOAEC (160 mg/kg diet) that will be used for risk assessment will be based on the growth endpoints from the 2-year chronic feeding study (MRID 44988429).

Table B12. Chronic toxicity of acetamiprid to mammals.

| Species (Test Type) | Test Substance | Measured Effect | NOAEC (mg ai/kg diet) | LOAEC (mg ai/kg-diet) | MRID |
|--|--------------------------|--|--------------------------|--------------------------|-----------------------|
| Laboratory Rat (Subchronic Dietary: 13 weeks) | Technical acetamiprid | Body weight, weight gain, and food consumption | 200 | 800 | 44651843 |
| Laboratory Rat (Chronic feeding: 24 months) | Technical acetamiprid | Female body weight, female weight gain | 160 | 400 | 44988429; 45245304 |
| Laboratory Rat (Two-generation reproduction) | Technical acetamiprid | <u>Parental Toxicity:</u> Body weight, weight gain, food consumption | 280 | 800 | 44988430 |
| | | <u>Offspring Toxicity:</u> Pup weight, litter size, viability and weaning indices, age to maturation | 280 | 800 | |
| | | <u>Reproductive Toxicity:</u> Litter size, pup weights | 280 | 800 | |

Terrestrial Invertebrates

Supplemental acute oral and contact honeybee (*Apis mellifera*) toxicity tests are available (**Table B13**). Honeybees were exposed to acetamiprid in an oral study as follows: 0 (control), 1.38, 2.6, 4.9, 10.21, 20.0 and 39.17 µg ai/bee. Mortality at 48-hrs averaged 6.7, 26.7, 36.7, 40, 26.7 and 30.0%, respectively. The study was carried out to 72-hrs, when the mortality averaged 10, 30, 36.7, 46.7, 50.0 and 30.0%, respectively. Both the 48 and 72-hr mortality in the dimethoate toxic reference averaged 50%. Dimethoate is commonly used as a positive control in honeybee studies to ensure the population of bees in the study demonstrates expected susceptibility to a known toxicant. Since none of the concentrations had greater than 50% mortality, it is not possible to calculate an LD₅₀ value for acetamiprid; however, roughly 50% mortality was observed in the 20 µg ai/bee treatment. The NOAEC is 1.38 µg ai/bee based on decreased survival. With an LD₅₀ of greater than 10.21 µg ai/bee, acetamiprid is classified as practically non-toxic to honeybees on an acute exposure basis.

In the acute contact toxicity test, the percent mortality was 40, 66.7, 46.7, 63.3, and 60% for the 6.25, 12.5, 25, 50, and 100 µg ai/bee test groups, respectively. The LC₅₀ for the contact study was reported as 8.1 µg/bee. However, there is uncertainty in this LC₅₀ value since no clear dose-response relationship was apparent. Since percent mortality was 66.7% at 12.5 µg ai/bee, the median mortality concentration is considered to be below this value (*i.e.*, <12.5) suggesting that

acetamiprid should be considered moderately toxic to honeybees on an acute contact exposure basis.

In addition to honeybees, the effect of acetamiprid on bumble bees, *Bombus terrestris*, was investigated. Bumble bees were exposed to acetamiprid for 48 hours in both an acute oral and acute contact toxicity test. Measured concentrations in the oral toxicity test were 0 (control), 3.36, 6.76, 10.37, 21.36, and 31.78 µg ai/bee. By 48 hours in the oral test, there was 0.0, 18.2, 1.0, 37.5, and 100.0% mortality in the 3.36, 6.76, 10.37, 21.36, and 31.78 µg ai/bee concentrations and 8.3% in the control. The calculated LD₅₀ is 22.32 µg ai/bee and the NOAEC is 10.37 µg ai/bee, despite the mortality noted in the 6.76 µg ai/bee test concentration. The contact nominal concentration was 100 µg ai/bee and a negative control. At 48-hrs there was 3.3% mortality in both groups. The contact LD₅₀ is >100 µg ai/bee and the NOAEC is 100 µg ai/bee. Based on these results, acetamiprid is classified as practically nontoxic to bumble bees on both an acute oral and contact exposure basis.

Table B13. Acute toxicity of technical grade acetamiprid to non-target terrestrial invertebrates.

| Species | Test substance | LD ₅₀ (µg ai/bee) | Toxicity Category | MRID | Study Classification |
|--|-----------------------|---------------------------------|----------------------|----------|----------------------|
| Honey bee (<i>Apis mellifera</i>) | Technical acetamiprid | >10.21 (oral) | Slightly-toxic | 44651874 | Supplemental |
| | Technical acetamiprid | <12.5 (contact) | Moderately toxic | 44651874 | Supplemental |
| Bumble bee (<i>Bombus terrestris</i>) | Technical acetamiprid | 22.32 (oral) | Practically nontoxic | 45932503 | Supplemental |
| | Technical acetamiprid | >100 (contact) | Practically nontoxic | 45932503 | Supplemental |

A toxicity of residues on foliage study for honeybees was submitted (MRID 44651875) but was deemed unacceptable due to low recovery of acetamiprid on treated foliage. A second residues on foliage toxicity study was submitted, but has not yet been reviewed by EFED (MRID 45346901). Two semi-field studies conducted to evaluate the possible effect of acetamiprid on honeybee behavior were also submitted (MRIDs 45932504; 45932505), and were classified as supplemental²⁶. Both studies used tents to expose honeybees via contact with forage and/or overspray, and applications rates were equivalent to 0.15 and 0.09 lbs ai/A, which is in line with single application rates for many registered and proposed crop uses. Mortality, flight frequency, and foraging behavior were evaluated relative to a control and a known toxic standard. No significant effects on any endpoints were observed in either study from acetamiprid treatments.

In the ECOTOX database, Iwasa *et al.*, 2004, report an LD₅₀ of 7.07 µg ai/bee in a 24 hr contact study. This endpoint was based on nominal concentrations, but indicates that acetamiprid is moderately toxic to honeybees. A seven day study with speckled cutworm moth larvae (*Lacanobia subjuncta*) in a leaf litter substrate, Doerr *et al.*, 2004, reported an LC₅₀ of 71.3 mg/L. These values are provided for qualitative risk characterization. DERs have not yet been generated, but the papers have been submitted for evaluation, and will be reviewed as needed for

²⁶ Note: non-guideline studies cannot be rated “acceptable” since there are no guideline standards

the upcoming registration review risk assessment.

Several open literature studies of acetamiprid effects on honeybees are available for acetamiprid. These studies will be thoroughly reviewed as part of the upcoming registration review risk assessment, but are briefly summarized here. El Hassani *et al.* (2008) exposed bees to 0.1, 0.5, and 1 µg of active ingredient, and recorded increases in sucrose responsiveness, locomotor activity (total length walked), and responsiveness to water (proboscis extension reflex after stimulation by water), which are all considered activating effects since they signify increases in specific functions. Conversely, the lowest dose of acetamiprid (*i.e.*, 0.1 µg/bee) also impaired olfactory-related learning performance. A follow-up study by Aliouane *et al.* (2009) supported the previous water responsiveness finding. Laurino *et al.* (2011) found increased mortality in bees that ingested 50 and 100 ppm (ng/µl) of a formulation containing acetamiprid (5% ai). Mortality attributed to acetamiprid in the higher dose group was 50.85% compared to the control group, but these effects were only seen in bees that were starved for two hours before dosing. In the same study, bees fed sugar did not show any significant mortality from oral or indirect contact exposure to acetamiprid over a 72-hour observation period. In the above studies, acetamiprid generally exhibited lower toxicity to bees than a small sample of other neonicotinoids insecticides (*e.g.*, clothianidin). This supports a previous open literature laboratory study suggesting that nitroguanidine substituted neonicotinoids (*e.g.*, clothianidin, imidacloprid, thiamethoxam and dinotefuran) are more toxic to bees than their cyano-substituted neonicotinoids (*e.g.*, acetamiprid, thiacloprid) (Iwasa *et al.*, 2004). However, El Hassani *et al.* (2008) did show that acetamiprid, but not thiamethoxam, had a detectable impact on bee behavior at sublethal doses.

Effects of the acetamiprid degradate IM-1-5 on adult collembola, *Folsomia candida*, were examined at concentrations of 0 (control), 0.1, 0.5, 2.5, 12.5 and 62.5 mg/kg artificial soil over a 28- day exposure period (MRID 46255612). Reproduction was the measured endpoint. Reproduction was reduced by 15, 14, 8, 6 and 24% in the 0.1, 0.5, 2.5, 12.5 and 62.5 mg/kg treatments, respectively; reductions at the 2.5 and 12.5 mg/kg treatment levels were not statistically significant. The EC₅₀ for the study is >62.2 mg/kg-soil and the NOAEC is <0.1 mg/kg-soil.

Rove beetles, *Aleochara bilineata*, were exposed to the degradate IM-1-5 at concentrations of 0 (control), 0.1, 2.5 and 62.5 mg/kg sand substrate over an 87-day period (MRID 46255611). Fly pupae (*Delia antique*) were introduced on days 7, 14 and 21 (as food) to evaluate beetle reproduction. Adult beetles were removed on day 28, and fly pupae were removed on day 35. Beetle emergence was observed from day 39 to 87. Number of emerged beetles was the measurement endpoint. There was a 19% reduction in emergence at the highest test concentration. The EC₅₀ for the study is >62.5 mg/kg substrate and the NOAEC is 2.5 mg/kg substrate.

In a 14-day acute toxicity study, earthworms (*Eisenia foetida*) were exposed to acetamiprid at 0 (control), 4, 8, 15, 30 or 60 mg ai/kg dry weight of artificial substrate (MRID 44988412). The reference chemical used was chloroacetamide at 37 mg ai/kg of the substrate. The 14-day LC₅₀ was 9.12 mg ai/kg-substrate. The 7-day LC₅₀ was 10 mg ai/kg substrate. The NOEC and LOEC values were not determined. Acetamiprid is considered to be toxic to earthworms up to/and above a concentration of 4 mg ai/kg substrate.

Earthworms (*Eisenia foetida*) were exposed to IM-1-5 at nominal test concentrations of 0 (control), 4, 8, 15, 30, and 1000 mg/kg (MRID46255613). By 14 days, there were no mortalities. Reductions in body weight by day 14 were 2.9% in the 1000 mg/kg treatment group. No body weight reductions were observed in the control or the 4, 8, 15, and 30 mg/kg treatment groups. The LC₅₀ was >1000 ppm; a NOEC value was estimated at 1000 mg/kg.

Earthworms (*Eisenia foetida*) were exposed to the IM-1-5 degradate over an 8-week period at nominal test concentrations of 0 (control), 0.1, 0.5, 2.5, 12.5, and 62.5 mg/kg in artificial soil (MRID 46255614). By 28 days, there were no mortalities in the control or treatment groups. There were no significant differences in adult body weight changes or number of juveniles produced in any treatment group compared to the control. The LC₅₀ was >62.5 mg/kg and the NOEC value was 62.5 mg/kg.

Terrestrial Plants

The effect of acetamiprid on the seedling emergence and vegetative vigor of monocot: corn (*Zea mays*), oat (*Avena sativa*), onion (*Allium cepa*), perennial ryegrass (*Lolium perenne*), and dicot: cabbage (*Brassica oleracea*), cucumber (*Cucumis sativus*), lettuce (*Lactuca sativa*), soybean (*Glycine max*), tomato (*Lycopersicon esculentum*), and turnip (*Brassica rapa*) crops was studied at nominal concentrations (MRID 44988413). For the seedling emergence study, nominal concentrations were as follows: cabbage, cucumber, onion and tomato: 0.041, 0.081, 0.16, 0.33 and 0.65 lbs ai/A; corn, lettuce, oat, perennial ryegrass, soybean and turnip: 0.65 lbs ai/A. For the vegetative vigor study, nominal concentration were as follows: cabbage, oat, onion, soybean and tomato: 0.65 lbs ai/A; corn and cucumber: 0.041, 0.081, 0.16, 0.33 and 0.65 lbs ai/A; lettuce: 0.005, 0.01, 0.02, 0.041, 0.081 and 0.16 lbs ai/A; perennial ryegrass: 0.041, 0.081, 0.16, 0.33 and 0.65 lbs ai/A; and turnip: 0.02, 0.041, 0.081, 0.16, 0.33 and 0.65 lbs ai/A.

The seedling emergence part of this study was classified as supplemental because the weight of the seedlings was not measured. Measurement of both plant weight and plant height are required, but only plant height was measured in this study. The percent seedling emergence was not affected in all species tested after exposure to acetamiprid. There was, however, reduction in shoot length of cucumber, onion, and tomato exposed to acetamiprid at 0.15, 0.32 and 0.62 lbs ai/A. The most sensitive monocot species was onion with an EC₂₅ of 0.23 lbs ai/A. The most sensitive dicot species was cucumber, with an EC₂₅ of 0.16 lbs ai/A (**Table B14**). The NOEC based on the seedling emergence (shoot length) in cucumber (dicot) and onion (monocot) was 0.077 lbs ai/A.

The vegetative vigor part of this study was acceptable for all species except lettuce. The test with lettuce was classified as supplemental because significant adverse phytotoxic effects were observed in the control plants. In the vegetative vigor test, the shoot length in all species was not affected by acetamiprid treatment. Plant weight was also not affected in cabbage, corn, cucumber, oat, onion, soybean and tomato exposed to the compound. There was, however, a reduction in the plant weight of lettuce, perennial ryegrass, and turnip exposed to various concentrations of acetamiprid. The most sensitive monocot species in the vegetative vigor test was perennial ryegrass, with an EC₂₅ of 0.46 lbs ai/A and a NOAEC of 0.31 lbs ai/A. The most sensitive dicot species was lettuce, with a EC₂₅ of 0.016 lbs ai/A and a NOEC of 0.0094 lbs ai/A.

A subsequent study was submitted concerning the effect of acetamiprid on vegetative vigor on lettuce alone (MRID 45921401). In this study, the EC₂₅ and NOAEC for plant weight were 0.012 and <0.0025 lbs ai/A, respectively. Shoot length was the more sensitive parameter with an EC₂₅ of 0.0056 and a NOAEC of 0.0025 lbs ai/A. Two other studies more closely examined the phytotoxic effects of acetamiprid on lettuce. Both studies (MRID 46229601 and 46229602) reported that the variety of lettuce used in the first two studies, buttercrunch, accounted for the greater sensitivity of lettuce relative to other species tested, and other varieties of lettuce exhibited reduced sensitivities.

Table B14. Summary of endpoints (lbs ai/A) in terrestrial plant toxicity studies submitted for acetamiprid.

| Species | | Seedling emergence | | Vegetative vigor | |
|----------|----------|--------------------|------------------|--------------------|------------------|
| | | NOAEC | EC ₂₅ | NOAEC | EC ₂₅ |
| Monocots | Oat | 0.62 | >0.62 | 0.67 | >0.67 |
| | Corn | 0.62 | >0.62 | 0.59 | >0.59 |
| | Onion | 0.077* | 0.23* | 0.65 | >0.65 |
| | Ryegrass | 0.62 | >0.62 | 0.31* | 0.46* |
| Dicots | Cucumber | 0.077* | 0.16* | 0.59 | >0.59 |
| | Soybean | 0.62 | >0.62 | 0.65 | >0.65 |
| | Turnip | 0.62 | >0.62 | 0.031 [†] | 0.2 |
| | Lettuce | 0.62 | >0.62 | 0.0025* | 0.0056* |
| | Tomato | 0.077 | 0.16 | 0.65 | >0.65 |
| | Cabbage | 0.62 | >0.62 | 0.67 | >0.67 |

* Most sensitive endpoint

[†] EC₀₅ is used when calculated EC₂₅ is less than derived NOAEC.

Appendix C. Example ECOSAR Output

Output for IM-1-5

SMILES : clcc(ncc1CN(C)C(C)=N)CL

CHEM :

CAS Num:

ChemID1:

ChemID2:

ChemID3:

MOL FOR: C9 H12 CL1 N3

MOL WT : 197.67

Log Kow: -0.68 (KowWin estimate)

Melt Pt:

Wat Sol: 1.7E+005 mg/L (WskowWin estimate)

ECOSAR v1.00 Class(es) Found

Halopyrdines

| ECOSAR Class | Organism | Predicted Duration | End Pt | mg/L (ppm) |
|--------------|-----------|-----------------------|--------|------------|
| Halopyrdines | : Fish | 96-hr | LC50 | 0.184 |
| Halopyrdines | : Daphnid | 48-hr | LC50 | 1.369 |
| Halopyrdines | : Fish | 32-day | ChV | 27.067 |
| Halopyrdines | : Daphnid | | ChV | 0.752 ! |

| | | | | |
|---------------------|---------------|-------|------|-----------|
| Neutral Organic SAR | : Fish | 96-hr | LC50 | 28010.680 |
| (Baseline Toxicity) | : Daphnid | 48-hr | LC50 | 11695.474 |
| | : Green Algae | 96-hr | EC50 | 1681.517 |
| | : Fish | | ChV | 2821.084 |
| | : Daphnid | | ChV | 672.943 |
| | : Green Algae | | ChV | 373.311 |

Note: * = asterisk designates: Chemical may not be soluble enough to measure this predicted effect.

Note: ! = exclamation designates: The toxicity value was determined from a predicted SAR using established acute-to-chronic ratios and ECOSAR regression techniques which are documented in the supporting Technical Reference Manual. When possible, this toxicity value should be considered in a weight of evidence approach.

Halopyrdines :

For Fish and Daphnid Acute Toxicity Values: If the log Kow of the chemical is greater than 5.0, or if the compound is solid and the LC50 exceeds the water solubility by 10X, no effects at saturation are predicted for these endpoints.

For Green Algae Acute Toxicity Values: If the log Kow of the chemical is greater than 6.4, or if the compound is solid and the EC50 exceeds the water solubility by 10X, no effects at saturation are predicted for these endpoints.

For All Chronic Toxicity Values: If the log Kow of the chemical is greater than 8.0, or if the compound is solid and the ChV exceeds the water solubility by 10X, no effects at saturation are predicted for these endpoints.

ECOSAR v1.00 SAR Limitations:

Maximum LogKow: 5.0 (LC50)
Maximum LogKow: 6.4 (EC50)
Maximum LogKow: 8.0 (ChV)
Maximum Mol Wt: 1000

Baseline Toxicity SAR Limitations:

Maximum LogKow: 5.0 (Fish 96-hr LC50; Daphnid LC50)
Maximum LogKow: 6.4 (Green Algae EC50)
Maximum LogKow: 8.0 (ChV)
Maximum Mol Wt: 1000

Appendix D. Reference List for OPPTS 835 Guidelines

The Office of Prevention, Pesticides, and Toxic Substances (OPPTS) became the Office of Chemical Safety and Pollution Prevention (OCSP) in 2011. The guidelines have not been updated since the name change and the titles still use OPPTS.

| OPPTS Guideline | Citation |
|---|---|
| Hydrolysis 835.2120 (161-1) | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.2120 Hydrolysis</i> . E. 712-C-08-012. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 5, 2012). |
| Aqueous Photolysis 835.2240 (161-2) | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.2240 Photodegradation in Water</i> . E. 712-C-08-013. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 5, 2012). |
| Soil Photolysis 835.2410 (161-3) | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.2410 Photodegradation in Soil</i> . E. 712-C-08-015. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 5, 2012). |
| Aerobic Soil Metabolism 835.4100 (162-1) | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.4100 Aerobic Soil Metabolism; OPPTS 835.4200 Anaerobic Soil Metabolism</i> . EPA 712-C-08-016 & E. 712-C-08-017. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 17, 2012). |
| Anaerobic Soil Metabolism 835.4200 (162-2) | |
| Aerobic Aquatic Metabolism 835.4300 (162-4) | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.4300 Aerobic Aquatic Metabolism; OPPTS 835.4400 Anaerobic Aquatic Metabolism</i> . EPA 712-C-08-018 & E. 712-C-08-019. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 17, 2012). |
| Anaerobic Aquatic Metabolism 835.4400 (162-3) | |
| Sorption coefficients 835.1230 (163-1) | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.1230 Adsorption/Desorption (Batch Equilibrium)</i> . E. 712-C-08-009. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 5, 2012). |
| Leaching and Aged Column Leaching 835.1240 | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.1240 Leaching Studies</i> . E. 712-C-08-010. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPPT-2009-0152-0007 (Accessed May 5, 2012). |

| OPPTS Guideline | Citation |
|---|--|
| Terrestrial Field Dissipation 835.6100 | USEPA. 2008. <i>Fate, Transport, and Transformation Guidelines. OPPTS 835.1230 Adsorption/Desorption (Batch Equilibrium)</i> . E. 712-C-08-009. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Protection Agency. Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 5, 2012). |
| Aquatic Field Dissipation 835.6200 | USEPA. 2008. <i>Fate, Transport, and Transformation Test Guidelines. OPPTS Aquatic (Sediment) Field Dissipation</i> . EPA 712-C-08-021. October 2008. Office of Prevention, Pesticides, and Toxic Substances. United States Environmental Available at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series835.htm (Accessed May 15, 2012). |
| Bioconcentration Factor 850.1730 | USEPA. 1996. <i>Ecological Effects Test Guidelines. OPPTS 850.1730 Fish BCF</i> . E. 712-C-96-129. April 1996. Environmental Fate and Effects Division. Office of Pesticide Programs. United States Environmental Protection Agency. Available at http://www.epa.gov/opptsmnt/pubs/frs/publications/OPPTS_Harmonized/850_Ecological_Effects_Test_Guidelines/Drafts/850-1730.pdf (Accessed May 14, 2012). |
| Environmental Chemistry Method | USEPA. 1996. <i>Ecological Effects Test Guidelines. OPPTS 850.7100</i> . E. 712-C-96-348. April 1996. Office of Prevention, Pesticides, and Toxic Substances. Available at http://www.epa.gov/opptsmnt/pubs/frs/publications/OPPTS_Harmonized/850_Ecological_Effects_Test_Guidelines/Drafts/850-7100.pdf (Accessed May 17, 2012). |

Appendix E. Results from Screening Imbibition Program (SIP) and the Screening Tool for Inhalation Risk Assessment (STIR)

The Screening Imbibition Program (SIP v.1.0, Released June 15, 2010) was used to calculate an upper bound estimate of exposure using acetamiprid's solubility (4250 mg/L, MRID 44651803), the most sensitive acute and chronic avian toxicity endpoints (Zebra finch with LD₅₀ of 5.68 mg ai/kg-bw and Mallard duck NOAEC of less than 60.2 mg/kg-diet) and the most sensitive acute and chronic mammalian toxicity endpoints (Rat LD₅₀ of 146 mg ai/kg-bw and NOAEC of 7.1 mg ai/kg-bw/day or 160 mg ai/kg-diet). Based on the output, exposure through drinking water alone is potential acute and chronic risk to small birds and a potential chronic risk to small mammals. Results from SIP are shown below.

Inhalation is another potential exposure route for terrestrial vertebrates. Based on the vapor pressure of acetamiprid (7.5×10^{-10} Torr at 25°C), acetamiprid is nonvolatile from dry nonadsorbing surfaces and non-volatile from water and moist surfaces, and therefore risk from inhalation is not expected (AERU, 2012). The 4-hr LC₅₀ inhalation study using rats was greater than 1.15 mg/L (MRID 44651837). The STIR model (Screening Tool for Inhalation Risk) was used to evaluate inhalation risk to birds and mammals. The endpoints discussed above were used in the model. Results from STIR are shown below.

Results from SIP version 1.0

Table 1. Inputs

| Parameter | Value |
|---|----------------|
| Chemical name | acetamiprid |
| Solubility (in water at 25°C; mg/L) | 4250 |
| Mammalian LD ₅₀ (mg/kg-bw) | 146 |
| Mammalian test species | laboratory rat |
| Body weight (g) of "other" mammalian species | |
| Mammalian NOAEL (mg/kg-bw) | 160 |
| Mammalian test species | laboratory rat |
| Body weight (g) of "other" mammalian species | |
| Avian LD ₅₀ (mg/kg-bw) | 5.68 |
| Avian test species | other |
| Body weight (g) of "other" avian species | 12.1 |
| Mineau scaling factor | 1.15 |
| Mallard NOAEC (mg/kg-diet) | 60.2 |
| Bobwhite quail NOAEC (mg/kg-diet) | |
| NOAEC (mg/kg-diet) for other bird species | |
| Body weight (g) of other avian species | |
| NOAEC (mg/kg-diet) for 2nd other bird species | |
| Body weight (g) of 2nd other avian species | |

Enter body weight of 'other' avian species for LD50.

Table 2. Mammalian Results

| Parameter | Acute | Chronic |
|------------------------------------|--|--|
| Upper bound exposure (mg/kg-bw) | 731.0000 | 731.0000 |
| Adjusted toxicity value (mg/kg-bw) | 112.2974 | 123.0657 |
| Ratio of exposure to toxicity | 6.5095 | 5.9399 |
| Conclusion* | Exposure through drinking water alone is a potential concern for mammals | Exposure through drinking water alone is a potential concern for mammals |

Table 3. Avian Results

| Parameter | Acute | Chronic |
|-------------------------------------|--|--|
| Upper bound exposure (mg/kg-bw) | 3442.5000 | 3442.5000 |
| Adjusted toxicity value (mg/kg-bw) | 6.1247 | 2.9867 |
| Ratio of exposure to acute toxicity | 562.0681 | 1152.6191 |
| Conclusion* | Exposure through drinking water alone is a potential concern for birds | Exposure through drinking water alone is a potential concern for birds |

*Conclusion is for drinking water exposure alone. This does not combine all routes of exposure. Therefore, when aggregated with other routes (i.e., diet, inhalation, dermal), pesticide exposure through drinking water may contribute to a total exposure that has potential for effects to non-target animals.

Results from STIR Version 1.0.xlsx

Welcome to the EFED

Screening Tool for Inhalation Risk

This tool is designed to provide the user with a rapid method for determining the potential significance of the inhalation exposure to chemicals and mammalian toxicity data.

Input

Application and Chemical Information

| | |
|--|-------------|
| Enter Chemical Name | Acetamiprid |
| Enter Chemical Use | Soybean |
| Is the Application a Spray? (enter y or n) | y |
| If Spray What Type (enter ground or air) | air |
| Enter Chemical Molecular Weight (g/mole) | 222.68 |
| Enter Chemical Vapor Pressure (mmHg) | 7.50E-10 |
| Enter Application Rate (lb a.i./acre) | 0.25 |

Toxicity Properties

Bird

| | |
|--|-------|
| Enter Lowest Bird Oral LD ₅₀ (mg/kg bw) | 5.68 |
| Enter Mineau Scaling Factor | 1.15 |
| Enter Tested Bird Weight (kg) | 0.012 |

Mammal

| | |
|---|------|
| Enter Lowest Rat Oral LD ₅₀ (mg/kg bw) | 146 |
| Enter Lowest Rat Inhalation LC ₅₀ (mg/L) | 1.15 |
| Duration of Rat Inhalation Study (hrs) | 4 |
| Enter Rat Weight (kg) | 0.35 |

****NOTE**:** When entering values, press the "Enter" key in order to update linked cells.

Output

Results Avian (0.020 kg)

| | |
|--|----------|
| Maximum Vapor Concentration in Air at Saturation (mg/m ³) | 8.99E-06 |
| Maximum 1-hour Vapor Inhalation Dose (mg/kg) | 1.13E-06 |
| Adjusted Inhalation LD ₅₀ | 3.74E-01 |
| Ratio of Vapor Dose to Adjusted Inhalation LD ₅₀ | 3.02E-06 |
| Maximum Post-treatment Spray Inhalation Dose (mg/kg) | 2.40E-02 |
| Ratio of Droplet Inhalation Dose to Adjusted Inhalation LD ₅₀ | 6.42E-02 |

Exposure not Likely Significant

Exposure not Likely Significant

Results Mammalian (0.015 kg)

| | |
|--|----------|
| Maximum Vapor Concentration in Air at Saturation (mg/m ³) | 8.99E-06 |
| Maximum 1-hour Vapor Inhalation Dose (mg/kg) | 1.42E-06 |
| Adjusted Inhalation LD ₅₀ | 6.85E+01 |
| Ratio of Vapor Dose to Adjusted Inhalation LD ₅₀ | 2.07E-08 |
| Maximum Post-treatment Spray Inhalation Dose (mg/kg) | 3.02E-02 |
| Ratio of Droplet Inhalation Dose to Adjusted Inhalation LD ₅₀ | 4.41E-04 |

Exposure not Likely Significant

Exposure not Likely Significant

Appendix F. Agency risk quotient (RQ) metrics and levels of concern (LOC) for Federally-listed (listed) threatened/endangered and non-listed species per risk class

| Risk Class | Risk Description | RQ | LOC |
|--|---|--|------|
| Aquatic Animals (fish and invertebrates) | | | |
| Acute | Potential for effects to non-listed animals from acute exposures | Peak EEC/LC ₅₀ ¹ | 0.5 |
| Acute Restricted Use | Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification | Peak EEC/LC ₅₀ ¹ | 0.1 |
| Acute Listed Species | Listed species may be potentially affected by acute exposures | Peak EEC/LC ₅₀ ¹ | 0.05 |
| Chronic | Potential for effects to non-listed and listed animals from chronic exposures | 60-day EEC/NOEC (fish) | 1 |
| | | 21-day EEC/NOEC (invertebrates) | |
| Terrestrial Animals (mammals and birds) | | | |
| Acute | Potential for effects to non-listed animals from acute exposures | EEC ² /LC ₅₀ (Dietary) | 0.5 |
| | | EEC/LD ₅₀ (Dose) | |
| Acute Restricted Use | Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification | EEC ² /LC ₅₀ (Dietary) | 0.2 |
| | | EEC/LD ₅₀ (Dose) | |
| Acute Listed Species | Listed species may be potentially affected by acute exposures | EEC ² /LC ₅₀ (Dietary) | 0.1 |
| | | EEC/LD ₅₀ (Dose) | |
| Chronic | Potential for effects to non-listed and listed animals from chronic exposures | EEC ² /NOAEC | 1 |
| Plants | | | |
| Non-Listed | Potential for effects to non-target, non-listed plants from exposures | EEC/ EC ₂₅ | 1 |
| Listed Plant | Potential for effects to non-target, listed plants from exposures | EEC/ NOEC | 1 |
| | | EEC/ EC ₀₅ | |

Appendix G. Data Call-In Justification Tables for Non-Guideline Ecological Effects Studies

| |
|--|
| Study Title: Pollinator Larval Toxicity Study Guideline Number: Non-guideline Test Substance: Acetamiprid |
| Rationale for Requiring the Data <p>Acetamiprid is a systemic insecticide and is moderately toxic to young adult honey bees on an acute contact exposure basis. Previously submitted studies of acetamiprid do not provide information on the potential toxicity to developing honeybee brood (larvae and pupae). Since acetamiprid is a systemic pesticide, there is the potential for pollen and nectar to be contaminated with the product and subsequently brought back to the hive where larvae may be exposed. Therefore, a non-guideline honeybee larval toxicity study is recommended. The registrant should submit a proposed protocol for review and approval by EFED prior to initiation of the study.</p> |
| Practical Utility of the Data <p>How will the data be used? Data will be used to assess risk to non-target listed and non-listed terrestrial invertebrate species. This study would allow the Agency to refine the screening-level hazard assessment for beneficial terrestrial invertebrates. The effects data will be used to determine the potential for adverse effects on beneficial terrestrial invertebrates through direct effects on larval bees.</p> <p>How could the data impact the Agency's future decision-making? EPA is required by section 7(a)(2) of the Endangered Species Act (ESA) to ensure that any action it authorizes or takes "...is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat" and "to use the best scientific data available" in carrying out this obligation. The data EPA intends to call in are necessary to inform the determination required by ESA as to whether continued registration of a pesticide is or is not likely to jeopardize the species or its critical habitat. The lack of these data will limit the flexibility that the Agency and registrants have in coming into compliance with ESA and could result in use restrictions that are unnecessarily severe. In addition, the lack of these data may result in an uncertain assumed risk and potential mitigation of acetamiprid formulations under FIFRA.</p> |

| |
|--|
| Study Title: Residues in Pollen and Nectar/Field Residue Analysis Study Guideline Number: Non-guideline Test Substance: Acetamiprid |
| Rationale for Requiring the Data <p>Acetamiprid is a systemic insecticide and is moderately toxic to young adult honey bees on an acute contact exposure basis. The systemic nature of the compound necessitates the quantification of pollinator-relevant residues in treated flowering plants, since pollinators will be exposed to residues from either current or prior season applications (due to the potential for residues to accumulate in plants and trees). Residues in edible/transportable-to-hive parts of treated trees and plants, particularly pollen-shedding and nectar producing parts (<i>i.e.</i>, flowers and, if present, extra-floral nectaries) of plants may inform the potential for risk.</p> |

The Agency will consider multiple crops based on certain selective criteria, including, but not limited to, the estimated usage, the application method, and whether the crop is attractive to pollinators. Furthermore, the Agency will consider a semi-field, full-field, or greenhouse-based protocol lasting at least two years with multiple sampling time-steps. The protocol will depend on application type and crop. The registrant should consult the Agency on the design of the protocol prior to the initiation of the study.

Practical Utility of the Data

How will the data be used?

To assess risk to non-target listed and non-listed terrestrial invertebrate species. These data would allow the Agency to refine the screening level risk assessment for beneficial terrestrial invertebrates. Exposure data is an integral part of determining the potential for risk to beneficial terrestrial invertebrates through direct exposure from their food sources.

How could the data impact the Agency's future decision-making?

EPA is required by section 7(a)(2) of the Endangered Species Act (ESA) to ensure that any action it authorizes or takes "...is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat" and "to use the best scientific data available" in carrying out this obligation. The data EPA intends to call in are necessary to inform the determination required by ESA as to whether continued registration of a pesticide is or is not likely to jeopardize the species or its critical habitat. The lack of these data will limit the flexibility that the Agency and registrants have in coming into compliance with ESA and could result in use restrictions that are unnecessarily severe. In addition, the lack of these data may result in an uncertain assumed risk and potential mitigation of acetamiprid formulations under FIFRA.

Appendix H. Preliminary Estimate of Surface Water Concentrations for Ecological Risk Assessment

An EEC was estimated using the highest single application rate of 23.4 lbs a.i./A. An EEC for both a residential use setting and for perimeter treatment are both estimated using different assumptions. The perimeter treatment scenario resulted in higher EECs. The estimated application area for a perimeter treatment is up to 10 feet from the building and up to 3 foot on the surface of the building. A treated area factor was estimated using a housing density of four 2000 ft² houses per acre. Each house has a perimeter of 180 ft and treated area of 2340 ft² (180 ft x 13 ft). The estimated treated area per acre is then 9360 ft² which results in an estimated 21% of an acre (9360ft²/43560ft²/acre). The EEC from the residential scenario was multiplied by 0.21 to estimate an EEC to use as a screen for the perimeter treatment scenario. For other residential uses, it was assumed that half of a lot could be treated. Finally, the rice model was used to evaluate potential exposure for a cranberry use. Below are the output files from PRZM/EXAMS, GENEEC, and the rice model with EECs shown in Table H1.

Table H1. Preliminary Screening EECs for Acetamiprid Use in Residential Areas, Perimeter Treatments, and for Use on Cranberries

| Scenario | Model | Area Treated Factor | Estimated Environmental Concentration (mg/L) | | |
|-------------|------------|------------------------|--|--------|--------|
| | | | Peak | 21-day | 60-day |
| Residential | GENEEC | 0.5 | 0.5 | 0.5 | 0.5 |
| Perimeter | GENEEC | 0.21 | 0.21 | 0.21 | 0.21 |
| Residential | PRZM/EXAMS | ** | 0.72 | 0.71 | 0.70 |
| Perimeter | PRZM/EXAMS | 0.21 | 0.17 | 0.17 | 0.17 |
| Cranberry | Rice Model | 1.0 | 0.10 | 0.10 | 0.10 |

**PRZM/EXAMS was used to estimate exposure in a residential setting in California. The scenario was created specifically for California and it may not be conservative for the entire United States. The assumptions made were that there was half of the area was pervious and half impervious. It was assumed that half of the pervious surface was treated and 10% of the impervious surface was treated. Time series files from runs with an impervious surface scenario and residential scenario were combined to arrive at the final EEC.

```

RUN No.      1 FOR acetamiprid      ON      resident      * INPUT VALUES *
-----
RATE (#/AC)  No.APPS &      SOIL  SOLUBIL  APPL TYPE NO-SPRAY INCORP
ONE (MULT)   INTERVAL      Koc   (PPM )   (%DRIFT)  (FT)      (IN)
-----
23.400 ( 23.400)  1    1      227.0 4250.0  GRHIFI ( 6.6)      .0      .0

```

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

```

-----
METABOLIC  DAYS UNTIL  HYDROLYSIS  PHOTOLYSIS  METABOLIC  COMBINED
(FIELD)    RAIN/RUNOFF  (POND)      (POND-EFF)  (POND)      (POND)
-----
383.00      2           N/A        34.00- 4216.00  *****  1344.49

```

GENERIC EECs (IN MILLIGRAMS/LITER (PPM)) Version 2.0 Aug 1, 2001

```

-----
PEAK        MAX 4 DAY    MAX 21 DAY    MAX 60 DAY    MAX 90 DAY
GEEC        AVG GEEC     AVG GEEC     AVG GEEC     AVG GEEC
-----

```


1.01 1.01 1.00 .98 .96

stored as acetres.out

Chemical: acetamiprid

PRZM environment: CAresidentialRLF.txt modified Tuesday, 20 February 2007
at 13:04:34

EXAMS environment: pond298.exv modified Wedday, 15 November 2006 at
13:47:26

Metfile: w23234.dvf modified Wedday, 3 July 2002 at 10:04:22

Water segment concentrations (ppb)

| Year | Peak | 96 hr | 21 Day | | 60 Day | 90 Day | Yearly |
|------|-------|-------|--------|-------|--------|--------|--------|
| 1961 | 39.37 | 39.29 | 39.24 | 39.07 | 38.9 | 32.79 | |
| 1962 | 124 | 123 | 122 | 120 | 119 | 106 | |
| 1963 | 211 | 211 | 209 | 207 | 206 | 192 | |
| 1964 | 273 | 272 | 269 | 266 | 265 | 256 | |
| 1965 | 270 | 270 | 270 | 270 | 269 | 265 | |
| 1966 | 280 | 279 | 279 | 279 | 279 | 274 | |
| 1967 | 508 | 506 | 498 | 488 | 483 | 449 | |
| 1968 | 494 | 494 | 491 | 489 | 489 | 476 | |
| 1969 | 537 | 536 | 535 | 531 | 528 | 509 | |
| 1970 | 562 | 561 | 559 | 554 | 553 | 535 | |
| 1971 | 529 | 529 | 528 | 528 | 528 | 518 | |
| 1972 | 507 | 507 | 507 | 507 | 506 | 499 | |
| 1973 | 582 | 581 | 579 | 577 | 575 | 554 | |
| 1974 | 561 | 561 | 560 | 559 | 558 | 548 | |
| 1975 | 569 | 569 | 568 | 565 | 563 | 548 | |
| 1976 | 554 | 553 | 552 | 552 | 551 | 540 | |
| 1977 | 567 | 567 | 565 | 563 | 563 | 555 | |
| 1978 | 619 | 618 | 616 | 612 | 611 | 592 | |
| 1979 | 678 | 677 | 675 | 671 | 668 | 644 | |
| 1980 | 682 | 682 | 680 | 678 | 675 | 655 | |
| 1981 | 693 | 692 | 689 | 685 | 683 | 662 | |
| 1982 | 923 | 920 | 909 | 900 | 896 | 864 | |
| 1983 | 894 | 893 | 890 | 889 | 887 | 856 | |
| 1984 | 821 | 821 | 819 | 818 | 817 | 802 | |
| 1985 | 796 | 795 | 794 | 793 | 793 | 776 | |
| 1986 | 825 | 824 | 822 | 817 | 815 | 786 | |
| 1987 | 802 | 801 | 799 | 795 | 794 | 774 | |
| 1988 | 759 | 758 | 757 | 755 | 755 | 741 | |
| 1989 | 713 | 713 | 712 | 709 | 709 | 698 | |
| 1990 | 692 | 692 | 690 | 689 | 688 | 674 | |

Sorted results

| Prob. | Peak | 96 hr | 21 Day | | 60 Day | 90 Day | Yearly |
|--------------------|------|-------|--------|-----|--------|--------|--------|
| 0.032258064516129 | 923 | 920 | 909 | 900 | 896 | 864 | |
| 0.0645161290322581 | | 894 | 893 | 890 | 889 | 887 | 856 |
| 0.0967741935483871 | | 825 | 824 | 822 | 818 | 817 | 802 |
| 0.129032258064516 | 821 | 821 | 819 | 817 | 815 | 786 | |
| 0.161290322580645 | 802 | 801 | 799 | 795 | 794 | 776 | |
| 0.193548387096774 | 796 | 795 | 794 | 793 | 793 | 774 | |
| 0.225806451612903 | 759 | 758 | 757 | 755 | 755 | 741 | |
| 0.258064516129032 | 713 | 713 | 712 | 709 | 709 | 698 | |
| 0.290322580645161 | 693 | 692 | 690 | 689 | 688 | 674 | |
| 0.32258064516129 | 692 | 692 | 689 | 685 | 683 | 662 | |

| | | | | | | |
|-------------------|-------|-------|-------|-------|------|-------|
| 0.354838709677419 | 682 | 682 | 680 | 678 | 675 | 655 |
| 0.387096774193548 | 678 | 677 | 675 | 671 | 668 | 644 |
| 0.419354838709677 | 619 | 618 | 616 | 612 | 611 | 592 |
| 0.451612903225806 | 582 | 581 | 579 | 577 | 575 | 555 |
| 0.483870967741936 | 569 | 569 | 568 | 565 | 563 | 554 |
| 0.516129032258065 | 567 | 567 | 565 | 563 | 563 | 548 |
| 0.548387096774194 | 562 | 561 | 560 | 559 | 558 | 548 |
| 0.580645161290323 | 561 | 561 | 559 | 554 | 553 | 540 |
| 0.612903225806452 | 554 | 553 | 552 | 552 | 551 | 535 |
| 0.645161290322581 | 537 | 536 | 535 | 531 | 528 | 518 |
| 0.67741935483871 | 529 | 529 | 528 | 528 | 528 | 509 |
| 0.709677419354839 | 508 | 507 | 507 | 507 | 506 | 499 |
| 0.741935483870968 | 507 | 506 | 498 | 489 | 489 | 476 |
| 0.774193548387097 | 494 | 494 | 491 | 488 | 483 | 449 |
| 0.806451612903226 | 280 | 279 | 279 | 279 | 279 | 274 |
| 0.838709677419355 | 273 | 272 | 270 | 270 | 269 | 265 |
| 0.870967741935484 | 270 | 270 | 269 | 266 | 265 | 256 |
| 0.903225806451613 | 211 | 211 | 209 | 207 | 206 | 192 |
| 0.935483870967742 | 124 | 123 | 122 | 120 | 119 | 106 |
| 0.967741935483871 | 39.37 | 39.29 | 39.24 | 39.07 | 38.9 | 32.79 |

0.1 824.6 823.7 821.7 817.9 816.8 800.4

Average of yearly averages: 546.026333333333

Inputs generated by pe5.pl - November 2006

Data used for this run:

Output File: acetres

Metfile: w23234.dvf

PRZM scenario: CAresidentialRLF.txt

EXAMS environment file: pond298.exv

Chemical Name: acetamiprid

| Description | Variable | Name | Value | Units | Comments |
|------------------------------|----------|-------|--|-------------------------|----------|
| Molecular weight | mwt | | 222.68 | g/mol | |
| Henry's Law Const. | henry | | 5.2E-14 | atm-m ³ /mol | |
| Vapor Pressure | vapr | | 7.5E-10 | torr | |
| Solubility | sol | 4250 | mg/L | | |
| Kd | Kd | | mg/L | | |
| Koc | Koc | 227 | mg/L | | |
| Photolysis half-life | kdp | 34 | days | Half-life | |
| Aerobic Aquatic Metabolism | kbacw | 1974 | days | Halfife | |
| Anaerobic Aquatic Metabolism | kbacs | 4116 | days | Halfife | |
| Aerobic Soil Metabolism | asm | 383 | days | Halfife | |
| Hydrolysis: pH 7 | 0 | days | Half-life | | |
| Method: | CAM | 1 | integer | See PRZM manual | |
| Incorporation Depth: | DEPI | 0 | cm | | |
| Application Rate: | TAPP | 26.22 | kg/ha | | |
| Application Efficiency: | APPEFF | 0.99 | fraction | | |
| Spray Drift | DRFT | 0 | fraction of application rate applied to pond | | |
| Application Date | Date | 01-01 | dd/mm or dd/mm or dd-mm or dd-mmm | | |

Record 17: FILTRA

IPSCND 1

UPTKF

Record 18: PLVKRT

PLDKRT

FEXTRC 0.5

Flag for Index Res. Run IR EPA Pond

Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as acetimpl.out

Chemical: acetamiprid

PRZM environment: CAImperviousRLF.txt modified Tuesday, 20 February 2007 at 13:05:44

EXAMS environment: pond298.exe modified Wedday, 15 November 2006 at 13:47:26

Metfile: w23234.dvf modified Wedday, 3 July 2002 at 10:04:22

Water segment concentrations (ppb)

| Year | Peak | 96 hr | 21 Day | 60 Day | 90 Day | Yearly |
|------|-------|-------|--------|--------|--------|--------|
| 1961 | 13.94 | 13.84 | 13.43 | 12.65 | 12.22 | 10.08 |
| 1962 | 20.15 | 20.06 | 19.77 | 19.2 | 18.87 | 17.26 |
| 1963 | 36.5 | 36.33 | 35.63 | 34.45 | 33.78 | 30.14 |
| 1964 | 31.34 | 31.32 | 31.21 | 30.98 | 30.82 | 29.72 |
| 1965 | 51.3 | 51.14 | 50.46 | 49.09 | 48.31 | 44.99 |
| 1966 | 59.57 | 59.4 | 58.76 | 58.33 | 57.81 | 54.67 |
| 1967 | 96.46 | 96.12 | 94.63 | 91.86 | 90.34 | 82.55 |
| 1968 | 98.5 | 98.32 | 97.67 | 96.4 | 95.57 | 90.78 |
| 1969 | 94.55 | 94.49 | 94.13 | 93.5 | 93.01 | 89.44 |
| 1970 | 91.67 | 91.61 | 91.34 | 90.67 | 90.19 | 86.78 |
| 1971 | 86.87 | 86.81 | 86.55 | 86.01 | 85.65 | 82.77 |
| 1972 | 82.58 | 82.52 | 82.32 | 81.82 | 81.45 | 78.75 |
| 1973 | 105 | 105 | 104 | 102 | 101 | 95.05 |
| 1974 | 118 | 118 | 117 | 115 | 114 | 108 |
| 1975 | 109 | 109 | 108 | 108 | 107 | 104 |
| 1976 | 106 | 106 | 106 | 106 | 105 | 102 |
| 1977 | 113 | 113 | 112 | 111 | 110 | 105 |
| 1978 | 107 | 107 | 107 | 106 | 105 | 101 |
| 1979 | 104 | 104 | 103 | 103 | 102 | 98.21 |
| 1980 | 101 | 101 | 100 | 99.61 | 99.11 | 95.47 |
| 1981 | 92.38 | 92.34 | 92.16 | 91.87 | 91.64 | 88.68 |
| 1982 | 97.7 | 97.56 | 97 | 95.99 | 95.37 | 91.44 |
| 1983 | 102 | 102 | 102 | 101 | 99.84 | 95.19 |
| 1984 | 96.4 | 96.34 | 96.01 | 95.4 | 94.93 | 91.36 |
| 1985 | 97.17 | 97.04 | 96.57 | 96.12 | 95.64 | 91.79 |
| 1986 | 101 | 101 | 101 | 99.62 | 98.91 | 94.6 |
| 1987 | 104 | 104 | 103 | 102 | 102 | 97.12 |
| 1988 | 99.71 | 99.61 | 99.22 | 98.44 | 97.91 | 94.06 |
| 1989 | 100 | 99.96 | 99.52 | 98.7 | 98.13 | 94.09 |
| 1990 | 107 | 106 | 106 | 105 | 104 | 99.42 |

Sorted results

| Prob. | Peak | 96 hr | 21 Day | 60 Day | 90 Day | Yearly |
|--------------------|------|-------|--------|--------|--------|--------|
| 0.032258064516129 | 118 | 118 | 117 | 115 | 114 | 108 |
| 0.0645161290322581 | | 113 | 113 | 112 | 111 | 110 |
| 0.0967741935483871 | | 109 | 109 | 108 | 108 | 107 |
| 0.129032258064516 | 107 | 107 | 107 | 106 | 105 | 102 |
| 0.161290322580645 | 107 | 106 | 106 | 106 | 105 | 101 |
| 0.193548387096774 | 106 | 106 | 106 | 105 | 104 | 99.42 |
| 0.225806451612903 | 105 | 105 | 104 | 103 | 102 | 98.21 |
| 0.258064516129032 | 104 | 104 | 103 | 102 | 102 | 97.12 |
| 0.290322580645161 | 104 | 104 | 103 | 102 | 101 | 95.47 |
| 0.32258064516129 | 102 | 102 | 102 | 101 | 99.84 | 95.19 |
| 0.354838709677419 | 101 | 101 | 101 | 99.62 | 99.11 | 95.05 |

| | | | | | | |
|-------------------|-------|-------|-------|-------|-------|-------|
| 0.387096774193548 | 101 | 101 | 100 | 99.61 | 98.91 | 94.6 |
| 0.419354838709677 | 100 | 99.96 | 99.52 | 98.7 | 98.13 | 94.09 |
| 0.451612903225806 | 99.71 | 99.61 | 99.22 | 98.44 | 97.91 | 94.06 |
| 0.483870967741936 | 98.5 | 98.32 | 97.67 | 96.4 | 95.64 | 91.79 |
| 0.516129032258065 | 97.7 | 97.56 | 97 | 96.12 | 95.57 | 91.44 |
| 0.548387096774194 | 97.17 | 97.04 | 96.57 | 95.99 | 95.37 | 91.36 |
| 0.580645161290323 | 96.46 | 96.34 | 96.01 | 95.4 | 94.93 | 90.78 |
| 0.612903225806452 | 96.4 | 96.12 | 94.63 | 93.5 | 93.01 | 89.44 |
| 0.645161290322581 | 94.55 | 94.49 | 94.13 | 91.87 | 91.64 | 88.68 |
| 0.67741935483871 | 92.38 | 92.34 | 92.16 | 91.86 | 90.34 | 86.78 |
| 0.709677419354839 | 91.67 | 91.61 | 91.34 | 90.67 | 90.19 | 82.77 |
| 0.741935483870968 | 86.87 | 86.81 | 86.55 | 86.01 | 85.65 | 82.55 |
| 0.774193548387097 | 82.58 | 82.52 | 82.32 | 81.82 | 81.45 | 78.75 |
| 0.806451612903226 | 59.57 | 59.4 | 58.76 | 58.33 | 57.81 | 54.67 |
| 0.838709677419355 | 51.3 | 51.14 | 50.46 | 49.09 | 48.31 | 44.99 |
| 0.870967741935484 | 36.5 | 36.33 | 35.63 | 34.45 | 33.78 | 30.14 |
| 0.903225806451613 | 31.34 | 31.32 | 31.21 | 30.98 | 30.82 | 29.72 |
| 0.935483870967742 | 20.15 | 20.06 | 19.77 | 19.2 | 18.87 | 17.26 |
| 0.967741935483871 | 13.94 | 13.84 | 13.43 | 12.65 | 12.22 | 10.08 |

0.1 108.8 108.8 107.9 107.8 106.8 103.8

Average of yearly averages: 81.4803333333333

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:

Output File: acetimpl

Metfile: w23234.dvf

PRZM scenario: CAImperviousRLF.txt

EXAMS environment file: pond298.exv

Chemical Name: acetamiprid

| Description | Variable Name | Value | Units | Comments |
|------------------------------|---------------|---------|--|-------------------------|
| Molecular weight | mwt | 222.68 | g/mol | |
| Henry's Law Const. | henry | 5.2E-14 | | atm-m ³ /mol |
| Vapor Pressure | vapr | 7.5E-10 | torr | |
| Solubility | sol | 4250 | mg/L | |
| Kd | Kd | | mg/L | |
| Koc | Koc | 227 | mg/L | |
| Photolysis half-life | kdp | 34 | days | Half-life |
| Aerobic Aquatic Metabolism | kbacw | 1974 | days | Halfife |
| Anaerobic Aquatic Metabolism | kbacs | 4116 | days | Halfife |
| Aerobic Soil Metabolism | asm | 383 | days | Halfife |
| Hydrolysis: pH 7 | 0 | | days | Half-life |
| Method: | CAM | 2 | integer | See PRZM manual |
| Incorporation Depth: | DEPI | 0 | cm | |
| Application Rate: | TAPP | 0.2622 | kg/ha | |
| Application Efficiency: | APPEFF | 0.99 | fraction | |
| Spray Drift | DRFT | 0 | fraction of application rate applied to pond | |
| Application Date | Date | 01-01 | dd/mm or dd/mm or dd-mm or dd-mm | |

Record 17: FILTRA

IPSCND 1

UPTKF

Record 18: PLVKRT

PLDKRT

FEXTRC 0.5

Flag for Index Res. Run IR EPA Pond

Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

Tier I Rice Model v2.0

$$\text{Equation: } \text{EEC} = (\text{App rate} * 100 / (\text{dw} + (\text{dsed} * (\theta + (\rho * \text{Kd} / 1000)))) * \exp(-\text{day} * k_{\text{AAM}})$$

Inputs

| Parameter | Value |
|----------------------------|-------|
| Application rate (lbs/A) | |
| Koc (L/kg) | 227 |
| If no Koc, enter Kd (L/kg) | |
| AAM t1/2 (d) | 384 |

Model Parameters

| Parameter | Value |
|--|-------|
| Water column depth (m) | 0.10 |
| Sediment depth (m) | 0.01 |
| Organic fraction of sediment | 0.01 |
| Sediment bulk density (kg/m ³) | 1300 |
| Sediment porosity | 0.509 |

Calculated Parameters

| Parameter | Value |
|-------------------|----------|
| Kd input (L/kg) | 2.27 |
| AAM rate constant | 0.001805 |
| App. rate (kg/ha) | 0.14573 |

Daily Output

| Day | EEC (µg/L) |
|-----|------------|
| 0 | 108.2689 |
| 1 | 108.0737 |
| 2 | 107.8788 |
| 3 | 107.6842 |
| 4 | 107.49 |
| 5 | 107.2962 |
| 6 | 107.1027 |
| 7 | 106.9095 |
| 8 | 106.7167 |
| 9 | 106.5243 |
| 10 | 106.3321 |
| 11 | 106.1404 |
| 12 | 105.949 |
| 13 | 105.7579 |
| 14 | 105.5672 |
| 15 | 105.3768 |
| 16 | 105.1867 |
| 17 | 104.997 |
| 18 | 104.8077 |
| 19 | 104.6187 |
| 20 | 104.43 |
| 21 | 104.2417 |
| 22 | 104.0537 |
| 23 | 103.866 |
| 24 | 103.6787 |
| 25 | 103.4917 |
| 26 | 103.3051 |
| 27 | 103.1188 |

Eco EECs

| Parameter | 108.27 | 107.49 | 106.70 | 105.91 |
|-----------|--------|--------|--------|--------|
| 3-d Tail | 107.68 | 105.76 | 102.15 | 78.94 |
| 21-d Tail | 104.24 | 102.36 | 98.88 | 78.42 |

DW EECs

| 3-d Tail | 107.68 | 78.94 | 91.53 | 67.10 | 72.15 | 52.89 | 60.30 |
|----------|--------|-------|-------|-------|-------|-------|-------|
|----------|--------|-------|-------|-------|-------|-------|-------|

